Test Report issued under the responsibility of:

Intertek

TEST REPORT
IEC/EN 60898-1
Circuit-breakers for over current protection for household and similar installations

Report Reference No. ..... :	130700021SHA-001
Date of issue ..... :	October 12, 2013
Total number of pages	83
CB/CCA Testing Laboratory ..... :	Intertek Testing Services Shanghai
Address ..... :	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Applicant's name ..... :	ELMARK INDUSTRIES SC
Address ..... :	2 Dobrudzha blvd., Dobrich, Bulgaria
Test specification:	
Standard ..... :	☒ IEC 60898-1:2002 (1st Edition) + A1:2002 + A2:2003 and/or ☒ EN 60898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012
Test procedure ..... :	CB&S
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IECEN60898_1C
Test Report Form(s) Originator ..... :	OVE
Master TRF ..... :	Dated 2007-12

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

If this Test Report Form is used by non-CCA members, the CIG logo and the reference to the CCA Procedure shall be removed.

This report is not valid as a CCA Test Report unless signed by an approved CCA Testing Laboratory and appended to a CCA Test Certificate issued by an NCB in accordance with CCA

Test item description ..... :	Circuit-breakers with overcurrent protection
Trade Mark ..... :	ELMARK
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	C61N
Ratings ..... :	U_e= 230/400V~, 1P
	I_n=1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

Testing procedure and testing location:	
☒ **CB/CCA Testing Laboratory:**	Intertek Testing Services Shanghai
Testing location/ address .....:	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
☒ **Associated CB Laboratory:**	Inspection Center of Products' Quality of Low Voltage Electric Apparatus in Zhejiang Province
Testing location/ address .....:	West Zhonghuan Road, Jiaxing City, Zhejiang Province, P.R.China
Tested by (name + signature) .....:	Allen Wang
Approved by (+ signature).....:	Jim Hua
☐ Testing procedure: TMP	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: WMT	
Tested by (name + signature) .....:	
Witnessed by (+ signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: SMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	
☐ Testing procedure: RMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	

Summary of testing:

The products comply with the requirements of IEC 60 898-1:2002 (1st Edition) + A1:2002 + A2:2003 and EN 60 898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012

Clause	Testing items	Testing location
6	Marking and other product information	CBTL
8.1.1	General	CBTL
8.1.2	Mechanism	CBTL
8.1.3	Clearances and creepage distances	CBTL
8.1.6	Non-interchangeability	CBTL
9.3	Test of Indelibility of marking	CBTL
9.4	Test of reliability of screws, current-carrying parts and connections.	CBTL
9.5	Reliability of terminals for external conductors	CBTL
9.6	Test of protection against electric shock	CBTL
9.7	Test of dielectric properties	
9.7.1	Resistance to humidity	CBTL
9.7.2	Insulation resistance of the main circuit	CBTL
9.7.3~9.7.6	Dielectric strength	CBTL
9.8	Test of temperature-rise	ACTL
9.9	28-days test	ACTL
9.10	Tripping characteristic	ACTL
9.11	Mechanical and electrical endurance	ACTL
9.12	short circuit	ACTL
9.13	Resistance to mechanical shock and impact	CBTL
9.14	Resistance to heat	CBTL
9.15	Resistance to abnormal heat and to fire	CBTL
9.16	Resistance to rust	CBTL

Summary of compliance with National Differences:

Copy of marking plate:

REMARKS:

1. Test at service short-circuit capacity (I_{cs}):
   For single-pole circuit-breakers of rated voltage 230/400V or 240/415V, an additional set of three samples is tested in a circuit according to figure 5. During the test the I^2t values need not be measured.
   The test procedure is shown as below:

Operation	Samples		
	1	2	3
1	O	O	O
2	--	CO	O
3	O	--	CO
4	CO	O	--

2. Test at rated short-circuit capacity (I_{cn}):
   For single-pole circuit-breakers of rated voltage 230/400V or 240/415V, an additional set of four samples is tested in a circuit according to figure 5. During the test the I^2t values need not be measured.
   The test procedure is shown as below:

Operation	Samples			
	1	2	3	4
1	O	O	O	--
2	O	CO	--	--
3	--	--	CO	O

Test item particulars	
Type of circuit-breaker ..... :	C61N
Number of poles ..... :	☒ 1-P ☐ 1-P+N ☐ 2-P ☐ 3-P ☐ 3-P+N ☐ 4-P ☐ Other .....
Protection against external influences ..... :	☐ enclosed ☒ unenclosed
Method of mounting ..... :	☐ surface ☒ flush ☒ panel board / distribution board
Method of connection ..... :	☐ not associated with the mechanical mounting ☒ associated with the mechanical mounting
Instantaneous tripping current ..... :	☐ B ☒ C ☐ D
Ambient air temperature (°C) ..... :	☒ 30°C ☐ 40°C ☐ Other _____°C
Energy limiting class ..... :	☐ Class 1 ☐ Class 2 ☐ Class 3
Rated short-circuit capacity (A) ..... :	☐ 1,5 kA ☒ 3 kA ☐ 4,5 kA ☒ 6 kA ☐ 10 kA ☐ 7,5 kA ☐ 20 kA ☐ 25 kA
Type of terminal ..... :	☐ screw [a) b)] ☒ pillar [a) b)] ☐ cage [a) b)] ☐ lug ☐ screw less [a)] ☐ flat quick connect [a)] ☐ plug-in ☐ screw-in [a)] copper conductors [b)] aluminium conductors***
Value of rated operational voltage ..... :	☐ 120 V ** ☐ 230 V ☐ 240 V ** ☐ 120/240 V ** ☒ 230/400 V ☐ 400 V ☐ 240/415 V ☐ 415 V
Value of rated current ..... :	1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A
Value of rated frequency ..... :	☒ 50 Hz ☒ 60 Hz
Rated impulse withstand voltage (Uimp)	☐ 2,5 kV** ☒ 4 kV ☐ declared ___kV
Material group and CTI declared by manufacturer	☐ Group I, (600 V ≤ CTI) ☐ Group II, (400 V ≤ CTI < 600 V) ☒ Group IIIa, (175 V ≤ CTI < 400 V)

Remark:

** delete for EN and *** only for EN

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Note: This TRF includes EN Group Differences together with National Differences and Special National Conditions, if any. All Differences are located in the Appendix to the main body of this TRF.

Throughout this report a ☒ comma or ☐ point is used as the decimal separator.

The basic part of this test report covers the evaluation of the IEC requirements.

Annex 1 of this test report covers the evaluation of the CENELEC common modifications.

Factory: ELMARK INDUSTRIES SC / 2 Dobrudzha blvd., Dobrich, Bulgaria

General product information:

C61N

Ue=230/400V~, 1P, C Type

I_n=1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

Icn=Ics=6kA, Uimp=4kV, 50/60Hz

Number of tests for simplified test procedure, according to table C.3 and C.4

Report ref.No	No. of poles	In(A)	Type	Test sequence and number of samples								
				A	B	C1	C2	D0+D1	D0	E1	E2	E3 [b]
130700021 SHA-001	1P	63	C	x	x	x	x	x	-	x	-	-
	1P	50	C	-	-	-	-	-	x[a]	-	-	-
	1P	40	C	-	-	-	-	-	x[a]	-	-	-
	1P	32	C	-	-	-	-	-	x[a]	-	-	-
	1P	25	C	-	-	-	-	-	x[a]	-	-	-
	1P	20	C	-	-	-	-	-	x[a]	-	-	-
	1P	16	C	-	-	-	-	-	x[a]	-	-	-
	1P	10	C	-	-	-	-	-	x[a]	-	-	-
	1P	6	C	-	-	-	-	-	x[a]	-	-	-
	1P	4	C	-	-	-	-	-	x[a]	-	-	-
	1P	2	C	-	-	-	-	-	x[a]	-	-	-
	1P	1	C	-	-	-	-	-	x[a]	x	-	-
130700021 SHA-002	2P	63	C	-	-	-	x	-	-	x	-	-
	2P	1	C	-	-	-	-	-	-	x	-	-
130700021 SHA-003	-	-	-	-	-	-	-	-	-	-	-	-
130700021 SHA-004	4P	63	C	x	x	x	x	x	-	x	-	-
	4P	1	C	-	-	-	-	-	-	x	-	-

Note:
a): For this test sequence only test of clause 9.10.2 is required according to table C.4.
b):Test sequence in EN 60898-1, due to Icn1=Icn, the test sequence is omitted.

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	TESTS „A": 1 SAMPLE: C63, 1 pole	**A_1**	
6 *)	**MARKING AND OTHER INFORMATION**		
*see Annex 1	Circuit-breaker marked with:		
	a) Manufacturer's name or trade mark .....:	ELMARK	
	b)Type designation, catalogue number or other identification number .....:	C61N	P
	c) Rated voltage (V).....:	230/400~	P
	d) Rated current (A) .....:	63	P
	e) Rated frequency (Hz) .....:		N/A
	f) Rated short circuit capacity (A) .....:	6000	P
	g) Wiring diagram		P
	h) Ambient air temperature, if different from 30°C		N/A
	i) Degree of protection, if different from IP20		N/A
	j) For D-type circuit-breakers: the maximum instantaneous tripping current, if higher than 20 In(see table 2)		N/A
	k) Rated impulse withstand voltage Uimp if it is 2,5 kV		N/A
	Symbol for instantaneous tripping current	C	P
	Symbol for nature of supply	~	P
	Marking for rated current and for instantaneous tripping shall be readily visible when CB is installed		P
	Other marking shall be easily discernible		P
	The suitability for isolation, which is provided by all circuit-breakers of this standard, may be indicated by the symbol on the device		P
	Energy limiting class		N/A
	I^2t characteristic (documentation)		N/A
	Symbols on supply and load terminal	"1", "2"	P
	Terminal for neutral conductor N		N/A
	Earthing terminal if any (IEC 60417-5019)		N/A
	On - off position shall be clearly indicated - 0 I -	I - O	P
	For push-button CB the off push-button shall either be red or be marked with the symbol '0'		N/A
	Red not used for other push-button		N/A
	This symbol shall be easily discernible		N/A
	For CB with multiple current ratings, the maximum value is marked, the adjusted value indicated without ambiguity		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Marking shall be indelible and easily legible (not on removable parts), 15 s with water, 15 s with hexane (see cl. 8.3)		P
8.	**REQUIREMENTS FOR CONSTRUCTION AND OPERATION**		
8.1.1	**General**		
8.1.2	**Mechanism**		
	The moving contact shall be mechanically coupled so that all poles make and break together, whether operated manually or automatically, even if an overload occurs on one pole only		N/A
	The switched neutral shall close before and open after the protected pole (s)		N/A
	Neutral pole having adequate making and breaking capacity and CB with independent manual operation: all poles operate together including neutral pole		N/A
	CB shall have a trip free mechanism		P
	It shall be possible to switch the CB on and off by hand		P
	No intermediate position of the contacts		P
	Position of contacts shall be indicated		P
	Indication visible from the outside		P
	If the indication is on the actuating means, it shall, when released, automatically take up or stay in the position corresponding to that of the moving contacts; operating means shall have two different rest positions, except that, for automatic operation, a third distinct rest position may be provided		P
	If a separate mechanical indicator is used to indicate the position of the main contacts, colour red shall be used for the on position and green for the off position.		P
	The action of the mechanism shall not be influenced by the position of enclosures		P
	If the cover is used as a guiding means for push-button, it shall not be possible to remove this button from the outside		N/A
	Operating means securely fixed, not possible to remove them without a tool		P
	For the up-down operating means the contacts shall be closed by the up movement.		P
8.1.3	**Clearances and creepage distances**		
8.1.3	**Clearances [mm] see table 4**		
	1.between live parts (of the main circuits) which are separated when the CB is in off position .....:	5,4mm	P

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Clause	Requirement + Test	Result - Remark	Verdict
	2.between live parts of different polarity.....:		N/A
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		N/A
	4. between live parts and		
	- accessible surfaces of operating means.....:	9,0mm	P
	- screws or other means for fixing covers .....:		N/A
	- surface on which the base is mounted.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal covers or boxes.....:		N/A
	- other accessible metal parts .....:	>8,0mm	P
	- metal frames supporting the base (flush-type) .:	>8,0mm	P
	5.between metal parts of mechanism and:		
	- accessible metal parts.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal frames supporting the base (flush type)..:		N/A
8.1.3	**Creepage distances [mm] (see table 4)**		
	Material group	☒ IIIa ☐ II ☐ I	P
	1.between live parts (of the main circuits) which are separated when the CB is in off position .....:	>8,0mm	P
	2.between live parts of different polarity.....:		N/A
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		N/A
	4. between live parts and		
	- accessible surfaces of operating means.....:	>10,0mm	P
	- screws or other means for fixing covers .....:		N/A
	- surface on which the base is mounted.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal covers or boxes.....:		N/A
	- other accessible metal parts .....:	>8,0mm	P
	- metal frames supporting the base (flush-type) .:	>8,0mm	N/A
	5.between metal parts of mechanism and:		
	- accessible metal parts.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal frames supporting the base (flush type)..:		N/A
8.1.4	**Screws, current-carrying parts and connections**		
8.1.4.1	Connections, withstand mechanical stresses occurring in normal use		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Screws for mounting of the CB not of the thread-cutting type		N/A
	Test according to cl. 9.4:		
	- 10 times (screw Ø / torque Nm)	Ø___mm___Nm (see table 10) Ø___mm___Nm	N/A
	- 5 times (screw Ø / torque Nm)	Ø 4,8 mm 2 Nm (see table 10) Ø___mm___Nm	P
	Plug in connections tested by plugging in and pulling out five times		P
	After test connections have not become loose nor electrical function impaired		P
8.1.4.2	Screws with a thread of insulating material ensured correct introduction		N/A
8.1.4.3	Electrical connection: contact pressure not transmitted through insulating material, unless there is sufficient resilience in the metallic parts		
	- copper		N/A
	- alloy 58% copper for worked cold parts		P
	- alloy 50% copper for other parts		N/A
	- other metal		N/A
8.1.5	**Terminals for external conductors**		
8.1.5.1	Terminals ensure correct connection of conductors (Test acc. to cl. 9.5 or annex J or K)	Rigid or stranded conductors	P
9.5	Torque Ø 4,8 mm 2 Nm Ø___mm___Nm Ø___mm___Nm max. sect. 25 mm²		P
9.5.1	Pull test: min sect. 1.0 mm², Pull 50 N max sect. 25 mm², Pull 100 N Pull 50/100 N for 1 min During the test conductor does not move noticeably		P
9.5.2	min sect. 10 mm² Torque (2/3)=1,33 Nm max sect. 25 mm² The conductor shows no damage		P
9.5.3	Nominal cross-section from 1.0 to 25 mm² No of wires 7 Ø of wires 0,67 mm Ø of wires 2,14 mm Torque (2/3) = 1,33Nm After the test no wire escaped outside		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.1.5.2	Terminals allow the connection of conductors of the following cross-sectional areas: (table 5)		P
	Rated current (A) / Range of nominal cross sections to be clamped (mm²): **≤ 13: 1 to 2,5** **> 13 ≤ 16: 1 to 4** **> 16 ≤ 25: 1,5 to 6** **> 25 ≤ 32: 2,5 to 10** **> 32 ≤ 50: 4 to 16** **> 50 ≤ 80: 10 to 25** > 80 ≤ 100: 16 to 35 > 100 ≤ 125: 25 to 50		P
	It is required that, for current ratings up to and including 50 A terminals are designed to clamp solid conductors as well as rigid stranded conductors; the use of flexible conductors is permitted		P
	Nevertheless, it is permitted that terminals for conductors having cross-sections from 1 mm^2 up to 6 mm^2 are designed to clamp solid conductors only.	____ to _____ mm²	N/A
8.1.5.3	Means for clamping the conductors in the terminals not serve to fix any other component (See test sub-clause 9.5)		P
8.1.5.4	Terminals for $I_N \leq 32$ A allow the connection of conductors without special preparation		P
8.1.5.5	Terminals shall have adequate mechanical strength; ISO thread or equivalent (See tests of sub-clause 9.4 and 9.5.1)		P
8.1.5.6	Clamping of conductor without damage to the conductor (See test of sub-clause 9.5.2)		P
8.1.5.7	Clamping of conductor between metal surfaces (See tests of sub-clause 9.4 and 9.5.1)		P
8.1.5.8	Conductor shall not slip-out when the clamping screw or nuts are tightened (See test of sub-clause 9.5.3)		P
8.1.5.9	Terminals shall be properly fixed. No work loose when the clamping screws or nuts are tightened or loosened (See test of sub-clause 9.4)		P
8.1.5.10	Clamping screws or nuts of terminals for protective conductors adequately secured against accidental loosening		N/A
8.1.5.12	Screws and nuts of terminals for external conductors shall be in engagement with a metal thread, and the screws shall not be of tapping screw type		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.1.6	**Non interchangeability**		
	For circuit-breakers intended to be mounted on bases forming a unit therewith (plug-in or screw-in type) it shall not be possible, without the aid of a tool, to replace a circuit-breaker when mounted as for normal use by another of the same make having a higher rated current, compliance is checked by inspection		P
8.1.7	**Plug-in type circuit-breakers, the holding in position of which does not depend solely on their plug-in connection(s), shall be reliable and have adequate stability**		
8.1.7.1	Plug-in type circuit-breakers, the holding in position of which does not depend solely on their plug-in connection(s) Compliance of the mechanical mounting is checked by the relevant test 9.13		N/A
8.1.7.2	Plug-in type circuit-breakers, the holding in position of which does depend solely on their plug-in connection(s) Compliance of the mechanical mounting is checked by the relevant test 9.13		N/A
8.2	**Protection against electric shock**		
	Live parts not accessible in normal use		P
	For CB, other than plug-in type, external parts, other than screws and other means for fixing covers, which are accessible shall be of insulating material		N/A
	Unless the live parts are within an internal enclosure of insulating material: Lining - reliable fixed, - adequate thickness and - mechanical strength		P
	Inlet openings for cables shall be in insulating material or be provided with bushings or similar devices in insulating material Such device - shall be reliable fixed - shall have adequate mechanical strength		N/A
	For plug-in CB, external parts, other than screws and other means for fixing covers, which are accessible shall be in insulating material		N/A
	Metallic operating means insulated from live parts		N/A
	Metal parts of the mechanism not accessible and insulated from accessible metal parts, metal frames (for flush-type), screws or other means for fixing the base		P
	Replacement of plug-in CB possible without touching live parts		N/A
	Lacquer or enamel not considered		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.6	**Test of protection against electric shock**		
	Use of test finger so designed that each jointed can be turned through an angle of 90° with respect to the finger	Flush-type mounted as for Normal use	P
	Circuit-breaker with enclosures of thermoplastic material are additional tested at 35 °C for 1 min with a force of 75 N		P
7.10	**Resistance to heat**		
	CB sufficiently resistant to heat		P
9.14	**Test of resistance to heat**		
9.14.1	Test:		
	- without removable covers ..... 1 h (100 ± 2) °C	100	P
	- removable covers..... 1 h (70 ± 2) °C		N/A
	After the test no access to live parts, marking still legible		P
9.14.2	Ball pressure test for external parts of insulating material (parts retaining current-carrying parts and parts of the protective circuit in position) T = 125°C Ø of impression ≤ 2 mm	Impression: 1,5mm	P
9.14.3	Ball pressure test for external parts of insulating material (parts not retaining current-carrying parts and parts of the protective circuit in position T = (70 ± 2)°C or T = ___ °C = (40 ± 2)°C + max. temperature rise of sub-clause 8.8 Ø of impression ≤ 2 mm	Impression: 1,0 mm	P
8.11	Resistance to abnormal heat and to fire		
	External parts of insulating material shall not ignite or spread fire under fault or overload conditions		P
9.15	**Resistance to abnormal heat and to fire**		
	Glow wire test: No visible flame, no sustained glowing or flames and glowing extinguish within 30 s		
	external parts retaining current-carrying parts and parts of the protective circuit in position ..... (960 ± 15)°C	2,3s	P
	all other external parts ..... (650 ± 10)°C	No visible flame	P
8.12	Resistance to rusting		
	Ferrous parts adequately protected against rusting		
9.16	Test of resistance to rusting:		
	- 10 min immersed in a cold chemical degreaser such as methyl-chloroform or refined petrol		
	- 10 min immersed in a 10% solution of chloride in water at 20°C		

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Clause	Requirement + Test	Result - Remark	Verdict
	- 10 min at 95% humidity at 20°C		
	- 10 min at 100°C		
	No sign of rust		P

	TESTS „B“ 3 samples: C63, 1 pole	**B_1 B_2 B_3**	
8.3	**Dielectric properties and isolating capability**		
	CB shall have adequate dielectric properties and shall ensure isolation:		P
8.3.1	Dielectric strength at power frequency		
	Compliance is checked by the tests 9.7.1, 9.7.2 and 9.7.3 on circuit-breaker in new condition		P
8.3.2	Isolating capability		
	Circuit-breakers shall be suitable for isolation. Compliance is checked by the verification of compliance with the minimum clearances and creepage distances of item 1 of table 4 and by tests of 9.7.6.1 and 9.7.6.3.		P
8.3.3	Dielectric strength at rated impulse withstand voltage (U_{imp})		
	Circuit-breakers shall adequately withstand impulse voltages. Compliance is checked by the tests of 9.7.6.2.		P
9.7	**Test of dielectric properties and isolating capability**		
9.7.1	Resistance to humidity		P
9.7.1.1	Preparation of the circuit-breaker for test		P
	Inlet openings, if any, are left open; if knock-outs are provided, one of them is opened.		N/A
9.7.1.2	Test conditions		
	The humidity treatment is carried out in humidity cabinet 91% to 95% and the temperature of the air between 20 °C and 30 °C	Rf =93,2 % T =25°C	P
9.7.1.3	Test procedure:		
	The sample is kept in the cabinet for 48 h.		P
9.7.1.4	Condition of the circuit-breaker after the test		
	After this treat, the sample show no damage within the meaning of this standard and shall withstand the tests of 9.7.2 and 9.7.3		P
9.7.2	Insulation resistance of the main circuit		
9.7.2	After an interval between 30 min and 60 min flowing this treatment, the insulation resistance is measured 5 s after application of a d.c. voltage of approximately 500 V, consecutively as follows:	[MΩ] [MΩ] [MΩ]	-
	a) In off-position, between the terminals which are electrically connected together when the circuit-breaker is in the closed position ≥ 2 MΩ	>500 MΩ >500 MΩ >500 MΩ	P

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Clause	Requirement + Test	Result - Remark	Verdict
	b) in off-position, between each pole in turn and the others connected together ≥ 2 MΩ		N/A
	c) in on-position, between all poles connected together and the frame ≥ 5 MΩ	>500 MΩ >500 MΩ >500 MΩ	P
	d) between metal parts of mechanism and the frame ≥ 5 MΩ		N/A
	e) between the frame and metal foil in contact with the inner surface of the internal enclosure or lining of insulating material ≥ 5 MΩ		N/A
9.7.3	Dielectric strength of the main circuit		
	After the circuit-breakers have passed the tests of 9.7.2 the test voltage specified in 9.7.5 is applied for 1 min between the parts indicated in 9.7.2		P
	a) 2000 V		P
	b) 2000 V		N/A
	c) 2000 V		P
	d) 2000 V		N/A
	e) 2500 V		N/A
9.7.4	Dielectric strength of the auxiliary and control circuits		
	For these tests, the main circuit shall be connected to the frame. The test voltage specified in 9.7.5 shall be applied for 1 min as follows:		N/A
	1) Between all the auxiliary or control circuits and the frame U = ____ V	U = ____ V	N/A
	2) Between each part of the auxiliary or control circuits which may be isolated from the other parts of the auxiliary or control circuits and these other parts connected together U = [1000 V if Ui ≤ 60 V or 2Ui + 1000 V if Ui > 60 V]	U = ____ V	N/A
9.7.6	Verification of the impulse withstand voltage (across clearances and across solid insulation) and leakage current across open contacts		
9.7.6.1	Verification of the impulse withstand voltage across open contacts (suitability for isolation)		
	The 1,2/50µs impulse voltage shall be applied three times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	4kV	
	- sea level of the laboratory:	Sea level	
	- test Uimp on open main contacts (equipment suitable for isolating) (see table 13) :	U_{test} =6,2kV	
	- no unintentional disruptive discharge during the test's		P
9.7.6.2	Verification of impulse withstand voltage for the parts not test in 9.7.6.1		
	The 1,2/50µs impulse voltage shall be applied three times for each polarity at intervals of 1s minimum		

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Clause	Requirement + Test	Result - Remark			Verdict
	- rated impulse withstand voltage (kV) :	4kV			
	- sea level of the laboratory:	Sea level			
	- test Uimp main circuits (see table 14) :	U_{test} =4,9kV			
	Application of test voltage				
	i) Between all the phase pole(s) connected together and to the neutral pole (or path) of the circuit-breaker				N/A
	ii) Between all the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminals intended for the protective conductor(s)				P
	- no unintentional disruptive discharge during the test's				P
9.7.6.3	Verification of leakage currents across open contacts (suitability for isolation)				
	For circuit-breakers suitable for isolation, the leakage current shall be measured. Each pole having been submitted to the test of 9.12.11.2, or 9.12.11.3, or 9.12.11.4.2 or 9.12.11.4.3 is supplied at a test voltage of 1,1 times its rated operational voltage, the circuit-breaker being in the open position				
	The leakage current flowing across the open contacts is measured and shall not exceed 2 mA	$6,83\times10^{-3}$mA(Max.)			P
8.4	**Temperature rise**				
	Temperature rise does not exceed the limiting values stated in table V:	sect. 16 mm²			
9.8.2	Test current: I_N= (reach the steady-state value) Four-pole CB's: ☐ 1) Three poles loaded 2) One pole and neutral pole loaded ☐ 1) Four-poles loaded	I_N = 63A			
	Ambient air temperature.....:	Tamb= 22,6°C			
	Parts .....Temperature rise [K]	[K]	[K]	[K]	
	L1	38	49	39	P
	L2	-	-	-	
	L3	-	-	-	
	L4(N)	-	-	-	
	L3	-	-	-	
	N	-	-	-	
	Terminals for external connections 60				P
	External parts liable to be touched during manual operation of the circuit-breaker, including operating means of insulating material and metallic means for coupling of insulating operating means of several poles 40	11	10	11	P
	External metallic parts of operating means.....25	-	-	-	N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	Other external parts, including that face of the circuit-breaker is in direct contact with the mounting surface.....60	35	41	37	P
9.8.5	**Measurement of power losses**	**B_1**	**B_2**	**B_3**	
	Power loss do not exceed the values stated in table 15				P
	Test current: I_N = 63A (reach the steady state value)	63A			P
	Loaded one pole after the other				P
	Max. power loss : 13 W	W	W	W	
	L1	3,99	4,83	4,04	P
	L2	-	-	-	
	L3	-	-	-	
	L4(N)	-	-	-	
	L3	-	-	-	
	N	-	-	-	
8.5	Uninterrupted duty				
	Circuit-breakers operate reliable even after long service				P
9.9	**28 day test**				
	28 cycles- 21 h with current - 3 h without current cross sectional area. 16 mm²	I_N =63 A			
	During the test no tripping during the last period, temperature rise shall be measured				P
	Ambient air temperature.....:	22° C			
	Parts ..... Temperature rise [K]	[K]	[K]	[K]	
	Terminals for external connections 75K	47	56	48	P
	The temperature rise does not exceed the value measured during the temperature rise test (subclause 8.8) by more than 15 K				P
	Test current 1,45 I_N = 91,4A				P
	- Tripping within	[s]	[s]	[s]	
	- 1h (≤ 63 A)	104	77	83	P
	- 2h (> 63 A)				N/A

	TESTS „C" 3 +3 samples: C63, 1 pole				
8.7	**Test C_1: ..... Mechanical and electrical endurance**	**C_{1-1}**	**C_{1-2}**	**C_{1-3}**	
	Circuit-breaker shall be capable to perform an adequate number of cycles with rated current				
9.11.1	General test conditions				

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Clause	Requirement + Test	Result - Remark	Verdict
	Test: Test Voltage 230 V (rated voltage) Test Current 63 A (rated current) Power factor (0,85-0,9) Par. resistor _____ Ohm Cross sect. area 16 mm²	232V 63,3A 0,87	P
9.11.2	**Test procedure**		
	The circuit-breaker is submitted to 4000 operating cycles with rated current.	4000 cycles	
	- $I_N \leq 32$ A: 2 s on - 13 s off		N/A
	- $I_N > 32$ A: 2 s on - 28 s off	I_n= 63A	P
	During the test the circuit-breaker shall be operated as in normal use.		P
9.11.3	**Condition of the circuit-breaker after the test**		
	Following the test 9.11.2 the sample shall not show:		
	- undue wear		P
	- discrepancy between the position of the moving contacts and corresponding position of the Indicating device		P
	- damage to the enclosure permitting access to live parts by test finger (see 9.6		P
	- loosening of electrical or mechanical connections		P
	- seepage of sealing compound		N/A
	Moreover test current .....2,55 I_N= 161A	161	
	Opening time not less 1 s or more than	[s] [s] [s]	
	- 60 s (≤ 32 A)	- - -	N/A
	- 120 s (> 32 A)	27 24 26	P
	Dielectric strength reduced to 1500 V *)see Annex 1		P
9.12.11.2	**Test at reduced short-circuit currents**		
9.12.11.2.1	Test on all circuit-breakers		
9.12.11.2.1	Test at reduced short-circuit currents: Fig. 3	Figure 3	
	Test current:	Obtained	
	- 500 A or 10 In	I_{test} =632A	P
	Test voltage 1,05 Un	U_{test} = 246V	P
	Power factor 0,93-0,98	0,96	P
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 35 mm	P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	I_{Peak} (A) max. value		878		P
	Sequence: 6 x "0" and 3 x "CO"	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s	3,81	4,42	3,70	P
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12	**Verification of the circuit-breaker after short-circuit tests**				
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position	C_{1-1} [mA] $x10^{-3}$	C_{1-2} [mA] $x10^{-3}$	C_{1-3} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	7,01	6,94	6,88	P
	L2	-	-	-	N/A
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A

	TESTS „C" 3 +3 samples: C63, 1 pole	C_{2-1}	C_{2-2}	C_{2-3}	
9.12.11.2.2	**Test C_2 : Short-circuit test on circuit-breakers rated 230 V, or 240 V or 230/400 V for verifying for use in IT systems**				
	Test current:	Obtained			
	- 500 A or 1,2 times the upper limit of the standard	I_{test}=762A			P
	Test voltage 1,05 Un	U_{test}= 436V			P
	Power factor 0,93-0,98	0,97			P
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 35 mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm			N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	I_{Peak} (kA) max. value	1,07			P
	Sequence: "0" + "CO" on each protected pole	[kA^2s]	[kA^2s]	[kA^2s]	
	Shifted point 30 ° on the other protected pole	C_{2-1}	C_{2-2}	C_{2-3}	
	Max. $I^2t \leq$ _____kA^2s L1	5,86	4,63	4,77	P
	L2	–	–	–	
	L3	–	–	–	
	L4	–	–	–	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times U_n.= 440V. The circuit –breaker is in the open position	C_{2-1} [mA] $x10^{-3}$	C_{2-2} [mA] $x10^{-3}$	C_{2-3} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,24	5,98	6,27	P
	L2	-	-	-	N/A
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 3 SAMPLES: C63, 1 pole				
8.6	**Automatic operation**				
8.6.1	Standard time-current zone				
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.				
9.10	**Tests: D_O**	**D_{1-1}**	**D_{1-2}**	**D_{1-3}**	
	I_N (A)	63A			
	Sect. (mm²)	16mm²			
	Instantaneous tripping current	☐ B	☒ C	☐ D	
9.10.1	Test of time-current characteristic				
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	71,2A			
	- 1 h ($I_N \leq 63$ A)	>1h	>1h	>1h	P
	- 2 h ($I_N > 63$ A)				N/A
	No tripping				P
	Then steadily increased within 5 s to 1,45 I_N (A)	91,4A			
	- Tripping within	[min]	[min]	[min]	
	- 1h (≤ 63 A)	3,3	2,7	3,8	P
	- 2h (> 63 A)				N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	161A			
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s				N/A
	- 120 s	29	26	27	P
9.10.2	Test of instantaneous tripping and of correct opening of the contacts				
9.10.2.1	General test conditions				
	For the lower values of the test current the test is made once, at any convenient voltage.				
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.				
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min				
	The tripping time of the O operation is measured				
	After each operation the indicating means shall show the open position of the contacts				P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type				
*see Annex 1	Test current 3I_N (A), starting from cold				
	Opening time:	[s]	[s]	[s]	
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*				N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*				N/A
	Test current 5 I_N (A), starting from cold				

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Clause	Requirement + Test	Result - Remark			Verdict
	Tripping less than 0,1 s				N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type				
*see Annex 1	Test current $5I_N$ (A), starting from cold	315A			
	Opening time:	[s]	[s]	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*				N/A
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*	4,8	3,9	4,8	P
	Test current 10 I_N (A), starting from cold	634A			
	Tripping less than 0,1 s	7,6ms	7,8ms	8,0ms	P
9.10.2.4 *)	☐ For circuit-breakers of the D – Type				
*see Annex 1	Test current $10I_N$ (A), starting from cold	-			
	Opening time:	[s]	[s]	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*				N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*				N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold				
	Tripping less than 0,1 s				N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:				
	Test current 1,1 It (A), (two pole) starting from cold	———			
	Tripping within	[min]	[min]	[min]	
	- 1h				N/A
	- 2h				N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	———			
	Tripping within	[min]	[min]	[min]	
	- 1h				N/A
	- 2h				N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics				
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C			
	Test current 1,13 I_N (A)	71,2A			
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	120A			
	Tripping within	[s]	[s]	[s]	
	- 1h	190	172	239	P
	- 2h				N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	63A	
	No tripping within		
	- 1h	>1h >1h >1h	P
	- 2h		N/A

	TESTS: D_1	**D_{1-1}** **D_{1-2}** **D_{1-3}**	
8.9	**Resistance to mechanical shock and impact**		
	CB shall have adequate mechanical behaviour so as to withstand the stresses imposed during installation and use		P
9.13.1	**Mechanical shock**		
	- 50 falls on two sides of vertical board C		
	- Vertical board turned 90°		
	- 50 falls on two sides of vertical board C		
	During the test the circuit-breakers shall not open		P
9.13.2	**Mechanical impact**		
9.13.2.1	All types:		
	- Impact test: 10 blows-height 10 cm, no damage		P
9.13.2.2	Screw-in types:		
	- Torque 2,5 Nm for 1 min, no damage		N/A
9.13.2.3	CB intended to be mounted on a rail		
	- downward vertical 50 N for 1 min		P
	- upward vertical 50 N for 1 min, no damage		P
9.13.2.4	Plug-in types		
	The circuit-breaker are mounted in there normal position, complete with plug-in base but without cables and any cover plate		
	A force of 20 N applied for 1min to the circuit-breaker (see fig 17).		
	During this test the circuit-breaker part shall not become loose from the base and shall not show damage impairing further use.		P
9.12.11.3	**Test at 1500 A:**		
	Prospective current of 1500 A - power factor 0,93 to 0,98		
	Prospective current obtained (A)	$1,54x10^3$A	
	Power factor	0,96	
	Test voltage 1,05 Un	U_{test} = 246/426V	
	Test circuit: figure	Figure 3/5	
	T (min)	3 min	

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Clause	Requirement + Test	Result - Remark	Verdict
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 35 mm	
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm	
	Sequence	6-O, 2-CO, 1-O	
	I_{Peak} (kA) max. value	1,93	
	$I^2t \leq$ _____ kA^2s	[kA^2s] [kA^2s] [kA^2s]	
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 N	8,74 11,2 9,71 – – – – – – – – –	P
	- No permanent arcing		P
	- No flash-over between poles or between poles and frame		P
	- No blowing of the fuses F and F'		P
	- Polyethylene foil shows no holes		P
	After the test:		
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.		
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position	D_{1-1} [mA] $x10^{-3}$ D_{1-2} [mA] $x10^{-3}$ D_{1-3} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,41 6,38 6,36	P
	L2	- - -	N/A
	L3	- - -	N/A
	L4(N)	- - -	N/A
	Electric strength test:		
	Test voltage 1500 V (see 8.7.2)		
	a)		P
	b)		N/A
	c)		P
	d)		N/A
	e) 2000 V		N/A
	Test current 0.85x non tripping current (1,13 I_N)	60,6A	
	- Passed for 1h	>1h >1h >1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A	

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Clause	Requirement + Test	Result - Remark	Verdict

		D_{1-1} [s]	D_{1-2} [s]	D_{1-3} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	103	56	37	P

	TESTS „D" 1 SAMPLE: C1, 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-1}**	
	I_N (A)	1A	
	Sect. (mm²)	1,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	1,13A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	1,45A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	208	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	2,55A	
	opening time not less than 1 s or more than	[s]	
	- 60 s	20	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold	-	

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Clause	Requirement + Test	Result - Remark	Verdict
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
**see Annex 1*	Test current 5I_N (A), starting from cold	5,0A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	3,94	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	10,0A	
	Tripping less than 0,1 s	8,64ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	2,55A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	19	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
**see Annex 1*	Test current 10I_N (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	1,13A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	1,9A	
	Tripping within	[s]	
	- 1h	220	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	1,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

	TESTS „D“ 1 SAMPLE: C2 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-2}**	
	I_N (A)	2A	
	Sect. (mm²)	1,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	2,26A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	2,90A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	169	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	5,10A	
	opening time not less than 1 s or more than	[s]	
	- 60 s	23	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current $5I_N$ (A), starting from cold	10,0A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	4,26	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	20,0A	
	Tripping less than 0,1 s	8,88ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	5,10A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	23	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		

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Clause	Requirement + Test	Result - Remark	Verdict
*see Annex 1	Test current 10I_N (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	2,26A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	3,8A	
	Tripping within	[s]	
	- 1h	177	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	2,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 1 SAMPLES: C4 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-3}**	
	I_N (A)	4A	
	Sect. (mm²)	1,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	4,52A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	5,80A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	208	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	10,2A	
	opening time not less than 1 s or more than	[s]	
	- 60 s	22	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current 5I_N (A), starting from cold	20,0A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	4,01	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	40,2A	
	Tripping less than 0,1 s	8,56ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	10,2A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	21	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current 10I_N (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____	
	Tripping within	[min]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	4,52A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	7,60A	
	Tripping within	[s]	
	- 1h	197	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	4,00A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

	TESTS „D“ 1 SAMPLE: C6, 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-4}**	
	I_N (A)	6A	
	Sect. (mm²)	1,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	6,78A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	8,70A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	96	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	15,3A	
	opening time not less than 1 s or more than	[s]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 60 s	18	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current $5I_N$ (A), starting from cold	30,0A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	2,94	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	60,2A	
	Tripping less than 0,1 s	8,22ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	15,3A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	17	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current $10I_N$ (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	———————	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	———————	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	6,78A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	11,4A	
	Tripping within	[s]	
	- 1h	87	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	6,00A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D" 1 SAMPLE: C10 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-5}**	
	I_N (A)	10A	
	Sect. (mm²)	1,5mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	11,3A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	14,5A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	57	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	25,5A	
	opening time not less than 1 s or more than	[s]	
	- 60 s	15	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current 5I_N (A), starting from cold	50,0A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	1,96	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	101A	
	Tripping less than 0,1 s	7,84ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	25,5A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	15	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current 10I_N (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	———	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	———	
	Tripping within	[min]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	11,3A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	19,0A	
	Tripping within	[s]	
	- 1h	53	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	10,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

	TESTS „D" 1 SAMPLE: C16 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**$D_{0\text{-}6}$**	
	I_N (A)	16A	
	Sect. (mm²)	2,5mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	18,1A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	23,2A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	121	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	40,8A	
	opening time not less than 1 s or more than	[s]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 60 s	14	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current $5I_N$ (A), starting from cold	80,0A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	1,84	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	164A	
	Tripping less than 0,1 s	8,02ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	40,8A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	15	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current $10I_N$ (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	18,1A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	30,4A	
	Tripping within	[s]	
	- 1h	108	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	16,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 1 SAMPLE: C20 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-7}**	
	I_N (A)	20A	
	Sect. (mm²)	2,5mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	22,6A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	29,0A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	38	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	51,0A	
	opening time not less than 1 s or more than	[s]	
	- 60 s	14	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current 5I_N (A), starting from cold	100A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	1,58	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	202A	
	Tripping less than 0,1 s	7,66ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	51,0A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	13	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current 10I_N (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	————	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	————	
	Tripping within	[min]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	22,6A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	38,0A	
	Tripping within	[s]	
	- 1h	37	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	20,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

	TESTS „D“ 1 SAMPLE: C25 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-8}**	
	I_N (A)	25A	
	Sect. (mm²)	4,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	28,3A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	36,3A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	36	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	63,8A	
	opening time not less than 1 s or more than	[s]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 60 s	16	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current $5I_N$ (A), starting from cold	125A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	1,02	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	255A	
	Tripping less than 0,1 s	7,24ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	63,8A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	11	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current $10I_N$ (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	28,3A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	47,5A	
	Tripping within	[s]	
	- 1h	53	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	25,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	TESTS „D“ 1 SAMPLE: C32, 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-9}**	
	I_N (A)	32A	
	Sect. (mm²)	6,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	36,2A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	46,4A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	36	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	81,6A	
	opening time not less than 1 s or more than	[s]	
	- 60 s	16	P
	- 120 s		N/A
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current 5I_N (A), starting from cold	160A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*	1,64	P
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*		N/A
	Test current 10 I_N (A), starting from cold	323A	
	Tripping less than 0,1 s	7,96ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	81,6A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)	17	P
	- 120 s (> 32A)		N/A
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current 10I_N (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____	
	Tripping within	[min]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	36,2A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	60,8A	
	Tripping within	[s]	
	- 1h	29	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	32,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

	TESTS „D“ 1 SAMPLE: C40 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-10}**	
	I_N (A)	40A	
	Sect. (mm²)	10,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	45,2A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	58,0A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	117	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	102A	
	opening time not less than 1 s or more than	[s]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 60 s		N/A
	- 120 s	12	P
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current $5I_N$ (A), starting from cold	200A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*	1,70	P
	Test current 10 I_N (A), starting from cold	408A	
	Tripping less than 0,1 s	8,12ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	102A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)	13	P
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current $10I_N$ (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	45,2A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	76,0A	
	Tripping within	[s]	
	- 1h	98	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	40,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 1 SAMPLE: C50 , 1 pole		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests: D_O**	**D_{0-11}**	
	I_N (A)	50A	
	Sect. (mm²)	10,0mm²	
	Instantaneous tripping current	☐ B ☒ C ☐ D	
9.10.1	Test of time-current characteristic		
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	56,5A	
	- 1 h ($I_N \leq 63$ A)	>1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	72,5A	
	- Tripping within	[s]	
	- 1h (≤ 63 A)	148	P
	- 2h (> 63 A)		N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	128A	
	opening time not less than 1 s or more than	[s]	
	- 60 s		N/A
	- 120 s	13	P
9.10.2	Test of instantaneous tripping and of correct opening of the contacts		
9.10.2.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.		
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.		
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		
	The tripping time of the O operation is measured		
	After each operation the indicating means shall show the open position of the contacts		P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type		
*see Annex 1	Test current $3I_N$ (A), starting from cold		
	Opening time:		
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current 5 I_N (A), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than		
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type		
*see Annex 1	Test current 5I_N (A), starting from cold	250A	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*	1,84	P
	Test current 10 I_N (A), starting from cold	509A	
	Tripping less than 0,1 s	8,34ms	P
9.10.1.2	Test current 2,55 In (A) starting from cold for:	128A	
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)	12	P
9.10.2.4 *)	☐ For circuit-breakers of the D – Type		
*see Annex 1	Test current 10I_N (A), starting from cold	-	
	Opening time:	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*		N/A
	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*		N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold		
	Tripping less than 0,1 s		N/A
9.10.1.2	Test current 2,55 In (A) starting from cold for:		
	opening time not less than 1 s or more than	[s]	
	- 60 s (≤ 32A)		N/A
	- 120 s (> 32A)		N/A
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:		
	Test current 1,1 It (A), (two pole) starting from cold	———	
	Tripping within	[min]	
	- 1h		N/A
	- 2h		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	———	
	Tripping within	[min]	

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Clause	Requirement + Test	Result - Remark	Verdict
	- 1h		N/A
	- 2h		N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics		
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C	
	Test current 1,13 I_N (A)	56,5A	
	- Passed for 1h	>1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	95,0A	
	Tripping within	[s]	
	- 1h	126	P
	- 2h		N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C	
	Test current I_N (A)	50,0A	
	No tripping within		
	- 1h	>1h	P
	- 2h		N/A

	TESTS „E" 3 + 3 SAMPLES **) SEE ANNEX 1* **: C63,1 pole**				
8.12.11.4.2	**Test: E_1 :Test at service short-circuit capacity**	**E_{1-1}**	**E_{1-2}**	**E_{1-3}**	
	Service short-circuit capacity.....:	6000A			
	Test circuit: figure .....:	Figure 3			
	Prospective current .....:	6000A			
	Prospective current obtained.....:	$6,07x10^3$A			
	Power factor .....:	0,65~0,70			
	Power factor obtained .....:	0,67			
	Sequence .....:	O - O - CO			
	T (min).....:	3min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value.....:	4,86			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	

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Clause	Requirement + Test		Result - Remark		Verdict
	Max. $I^2t \leq$ _____ kA^2s	L1	70,7	37,3	47,4	P
		L2	–	–	–	
		L3	–	–	–	
		N	–	–	–	
	- No permanent arcing					P
	- No flash-over between poles or between poles and frame					P
	- No blowing of the fuses F and F'					P
	- Polyethylene foil shows no holes					P
	After the test:					
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**					
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position		E_{1-1} [mA] $x10^{-3}$	E_{1-2} [mA] $x10^{-3}$	E_{1-3} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA	L1	7,34	7,21	6,84	P
		L2	-	-	-	N/A
		L3	-	-	-	N/A
		L4(N)	-	-	-	N/A
	Electric strength test:					
	Test voltage 1500 V (see 8.7.2)					
	a)					P
	b)					N/A
	c)					P
	d)					N/A
	e) 2000 V					N/A
	Test current 0.85x non tripping current (1,13 I_N)		60,6A			
	- Passed for 1h		>1h	>1h	>1h	P
	- Passed for 2h					N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s		101A			
			E_{1-1} [s]	E_{1-2} [s]	E_{1-3} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour		33	19	71	P

8.12.11.4.2	**Test: E_1(Test at service short-circuit capacity) three phase tests for single circuit-breakers**	E_{1-4}	E_{1-5}	E_{1-6}	
	Service short-circuit capacity.....:	6000A			
	Test circuit: figure .....:	Figure 5			
	Prospective current .....:	6000A			

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Clause	Requirement + Test	Result - Remark			Verdict
	Prospective current obtained.....:	$6,06x10^3$A			
	Power factor .....:	0,65~0,70			
	Power factor obtained .....:	0,68			
	Sequence .....:	See remark			
	T (min) .....:	3 min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45 mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value .....:	4,47			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s L1	-	-	-	N/A
	L2	-	-	-	
	L3	-	-	-	
	N	-	-	-	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position	E_{1-4} [mA] $x10^{-3}$	E_{1-5} [mA] $x10^{-3}$	E_{1-6} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,93	6,86	6,87	P
	L2	-	-	-	N/A
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non tripping current (1,13 I_N)	60,6A			
	- Passed for 1h	>1h	>1h	>1h	P

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Clause	Requirement + Test	Result - Remark			Verdict
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			
		E_{1-4} [s]	E_{1-5} [s]	E_{1-6} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	18	10	47	P

	TESTS „E" 3 + 3 SAMPLES **) SEE ANNEX 1* **: C1, 1 pole**				
8.12.11.4.2	**Test: E_1 :Test at service short-circuit capacity**	E_{1-7}	E_{1-8}	E_{1-9}	
	Service short-circuit capacity.....:	6000A			
	Test circuit: figure .....:	Figure 3			
	Prospective current .....:	6000A			
	Prospective current obtained.....:	6,07x10^{3}A			
	Power factor .....:	0,65~0,70			
	Power factor obtained .....:	0,67			
	Sequence .....:	O - O - CO			
	T (min) .....:	3min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value .....:	0,393			
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	
	Max. $I^2t \leq$ _____kA^{2}s L1	0,480	0,206	0,275	P
	L2	–	–	–	
	L3	–	–	–	
	N	–	–	–	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position	E_{1-7} [mA] x10^{-3}	E_{1-8} [mA] x10^{-3}	E_{1-9} [mA] x10^{-3}	
	The leakage current shall not exceed 2 mA L1	6,87	7,03	6,69	P

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Clause	Requirement + Test	Result - Remark			Verdict
	L2	-	-	-	N/A
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non tripping current (1,13 I_N)	0,97A			
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	1,60A			
		E_{1-7} [s]	E_{1-8} [s]	E_{1-9} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	103	197	128	P

8.12.11.4.2	**Test: E_1(Test at service short-circuit capacity) three phase tests for single circuit-breakers**	E_{1-10}	E_{1-11}	E_{1-12}	
	Service short-circuit capacity.....:	6000A			
	Test circuit: figure .....:	Figure 5			
	Prospective current .....:	6000A			
	Prospective current obtained.....:	6,06x10^{3}A			
	Power factor .....:	0,65~0,70			
	Power factor obtained .....:	0,68			
	Sequence .....:	See remark			
	T (min).....:	3 min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45 mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value .....:	0,357			
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	
	Max. $I^2t \leq$ _____kA^{2}s L1	-	-	-	N/A
	L2	-	-	-	
	L3	-	-	-	
	N	-	-	-	

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Clause	Requirement + Test	Result - Remark			Verdict
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position	$E_{1\text{-}10}$ [mA] $x10^{-3}$	$E_{1\text{-}11}$ [mA] $x10^{-3}$	$E_{1\text{-}12}$ [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,84	6,87	6,69	P
	L2	-	-	-	N/A
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non tripping current (1,13 I_N)	0,97A			
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	1,60A			
		$E_{1\text{-}10}$ [s]	$E_{1\text{-}11}$ [s]	$E_{1\text{-}12}$ [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	59	67	100	P

ANNEX C (NORMATIVE)			
Test sequence and number of samples to be submitted for certification purposes Table C.1 - Test sequences			
Test sequence		Clause or subclause	Test (or inspection)
A		6 8.1.1 8.1.2 9.3 8.1.3 8.1.6 9.4 9.5 9.6 9.14 8.1.3 9.15 9.16	Marking General Mechanism Indelibility of marking Clearance and creepage distances (external parts only) Non-interchangeability Reliability of screws, current-carrying parts and connections Reliability of terminals for external conductors Protection against electric shock Resistance to heat Clearances and creepage distances (internal parts) Resistance to abnormal heat and to fire Resistance to rusting
B		9.7 9.8 9.9	Dielectric properties Temperature-rise 28-day test
C	C_1	9.11 9.12.11.2.1 9.12.12	Mechanical and electrical endurance Performance at reduced short-circuit currents Verification of the circuit-breaker after short-circuit tests
	C_2	9.12.11.2.2 9.12.12	Short-circuit test for verifying the suitability of circuit-breakers for use in IT systems Verification of the circuit-breaker after short-circuit tests
D	D_0	9.10	Tripping characteristic
	D_1	9.13 9.12.11.3 9.12.12	Resistance to mechanical shock and impact Short-circuit performance at 1 500 A Verification of circuit-breaker after short-circuit tests
E	E_1	9.12.11.4.2 and 9.12.12	Service short-circuit capacity (I_{cs}) Verification of circuit-breaker after short-circuit tests
	E_2	9.12.11.4.3 and 9.12.12	Performance at rated short-circuit capacity (I_{cn}) Verification of circuit-breaker after short-circuit tests
NOTE With the agreement of the manufacturer the same samples may be used for more than one test sequence.			

Table C.2 - Number of samples for full test procedure				
Test sequence		Number of samples	Minimum number of samples which shall pass the test [a) b)]	Maximum number of samples for repeated tests [c)]
A		1	1	--
B		3	2	3
C	C_1	3	2 [e)]	3
	C_2 [f)]	3	2 [e)]	3
D		3	2 [e)]	3
E_1		3 + 4 [d)]	2 [e)] + 2 [d), e)]	3 + 4 [d)]
E_2		3 + 4 [d)]	2 [e)] + 2 [d), e)]	3 + 4 [d)]

a) In total, a maximum of two test sequences may be repeated.

b) It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

c) In the case of repeated tests, all results shall be acceptable.

d) Supplementary samples in the case of single-pole circuit-breakers rated 230/400 V or 240/415 V (see table 1).

e) All samples shall meet the test requirements of 9.12.10, 9.12.11.2, 9.12.11.3 and 9.12.11.4, as appropriate.

f) For this sequence read "number of protected poles" instead of "number of samples". In total a maximum of three test sequences may be repeated.

Table C.3 - Number of samples for simplified test procedure						
Test sequence		Number of samples depending on number of poles [a)]				
		One pole [b)]	Two poles [c)]	Three poles [d)]	Four poles [e)]
A		1 max. rated I_N	1 [g),i)] max. rated I_N	1 [i)] max. rated I_N	1 [i)] max. rated I_N
B		3 max. rated I_N	3 [g)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
C	C_1	3 max. rated I_N	3 [i)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
C	C_2	3 max. rated I_N	2 max. rated I_N for 2 protected poles, or 3 max. rated I_N for one protected pole	1 max. rated I_N	1 max. rated I_N
$D_0 + D_1$		3 max. rated I_N	3 [h)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
D_0		1 of all other rated I_N			
E_1		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N
E_2		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N

a) If a test is to be repeated according to the acceptance criteria of C.2, a new set of samples is used for the relevant test sequence. In repeated tests all results shall be satisfactory.

b) If only multipole circuit-breakers are submitted, this column applies to the set of samples having the

smallest number of poles (instead of the relevant column).

c) Applicable to two-pole circuit-breakers whether with two protected poles or with one protected pole.

d) This series is omitted when four-pole circuit-breakers are also tested.

e) Also applicable to circuit-breakers with three protected poles and a neutral pole.

f) Supplementary samples in case of single-pole circuit-breakers of 5.3.1.4.

g) This test sequence is omitted when three-pole or four-pole circuit-breakers have been tested.

h) This test sequence shall be omitted for two-pole circuit breakers with two protected poles, when three-pole or four-pole circuit-breakers have been tested.

i) When multipole circuit-breakers are submitted, a maximum of four screw-type terminals for external conductors are subjected to the tests of 9.5, i.e. two supply and two load terminals.

Table C.4 – Test sequences for a series of circuit-breakers being of different instantaneous tripping classifications

Circuit-breaker type-tested first	Subsequent test sequences for circuit-breakers of		
	B-type	C-type	D-type
B-type	–	$(D_o + D_1) + E$	$(D_o + D_1) + E$
C-type	D_o [a)] + B [a)]		$(D_o + D_1) + E$
D-type	D_o [a)] + B [a)]	D_o [a)] + B [a) b)]	–

a) For these test sequences only the tests of 9.8 and 9.10.2 are required.

b) When certification is requested at the same time for B-type, C-type and D-type circuit-breakers having the same rated short-circuit capacity, only test sequence Do is required if B-type and D-type samples have been tested.

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Clause	Requirement + Test	Result - Remark	Verdict

	Annex E		
	Special requirements for auxiliary circuits for safety extra-low voltage (*) (*) For auxiliary contact units assembled or to be assembled separately to circuit-breakers see EN62019.		
8.1.3	**Clearances and creepage distances**		
	Additional note to table 4 5) live parts in auxiliary circuits intended to be connected to safety extra low voltages shall be separated from circuits with higher voltages in accordance with the requirements of 411.1.3.3 of IEC 60364-4-41		--
	Compliance is checked by inspection		N/A
9.7.4	**Dielectric strength of the auxiliary circuits**		
	Note: a test for circuits intended for connection to safety extra-low voltage is under consideration		N/A
9.7.5	**Values of test voltage**		
	Note: The values of the test voltages for circuits intended for connection to safety extra-low voltage are under consideration		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Annex J		
	Particular requirements for circuit-breakers with screw less type terminals for external copper conductors (In not exceeding 20 A, cross-sectional area up to 4 mm^2		
J.6	**Marking**		
	Universal terminals		--
	- no marking		N/A
	Non-universal		--
	- declared for rigid-solid conductors	marked with: "sol"	N/A
	- declared for rigid(solid and stranded) ..... :	marked with: "r"	N/A
	- declared for flexible conductors ..... :	Marked with: "f"	N/A
	The markings should appear on the circuit-breaker or, if available space is not sufficient, on smallest package unit or in technical information ..... :		N/A
	Indication of length of insulation to be removed on the circuit-breaker ..... :	_____ mm	N/A
J.7	**Standard conditions for operation in service**		
	Clause 7 applies		N/A
J.8	**Constructional requirements**		
	Clause 8 applies with the follow modifications:		
	In clause 8.1.5 only –5.1, -5.2. –5.3, - 5.6 and -.5.7 apply		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.1	**Connection or disconnection of conductors**		
	The connection or disconnection shall be made by:		
	A general purpose tool or by a convenient device integral with the terminal or		N/A
	, for rigid conductors by simple insertion		N/A
	For disconnection an operation other than a pull shall be necessary (push-wire terminals)		N/A
	Universal terminals shall accept rigid (solid or stranded and flexible unprepared conductors		N/A
	Non-universal terminals shall accept conductors declared by the manufacturer		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.8.2	**Dimensions of connectable conductors**		
	The dimensions of connectable conductors are given in table J.1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The ability to connect these conductors shall be checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.3	**Connectable cross-sectional areas**		
	The nominal cross-sections to be clamped are given in table j.2		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.4	**Insertion and connection of conductors**		
	The insertion and disconnection of the conductors shall be made in accordance with the manufacturer's instructions		N/A
J.8.5	**Design and construction of terminals**		
	Terminals shall be designed and constructed that:		
	- each conductor is clamped individually		N/A
	- connection or disconnection connectors connected or disconnected separate or same		N/A
	- inadequate insertion of the conductor is avoided		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.6	**The terminals shall be resistant to ageing**		
	Compliance is checked by the tests of J.9.3		N/A
J.9	**Tests**		
	Clause 9 applies, by replacing 9.4 and 9.5 by the follow		N/A
J.9.1	**Test of reliability of screw less terminals**		
J.9.1.1	**Reliability of screw less system**		
	5 times connection and disconnection		N/A
	3 rigid conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A
	3 flexible conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A
	After tests, the terminal shall not be damage in such a way as to impair its further use		N/A
J.9.1.2	**Test of reliability of connection**		
	3 terminals of poles of new sample are fitted with new copper conductors according table J.2		N/A
	rigid conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A
	flexible conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Each conductor is either pushed as far as possible into the terminal or shall be inserted so that adequate connection is obvious		N/A
	After tests, no wire of the conductor shall have escaped outside the terminals		N/A
J.9.2.	**Tests of reliability of terminals for external conductors: Mechanical strength**		
	Three terminals of new samples are fitted with new conductors of the type and of the minimum and maximum cross sectional area according table J.2.		N/A
	Each conductor is subjected to a pull force of value shown in table J.3. for 1 min		N/A
	Terminal screw torque : $^{2}/_{3}$ of table 10	_____ Nm	N/A
	rigid conductors min. cross-section max. cross-section	_____ mm^2 / _____N _____ mm^2 / _____N	N/A
	flexible conductors min. cross-section max. cross-section	_____ mm^2 / _____N _____ mm^2 / _____N	N/A
	During the test the conductor shall not slip out of the terminal		N/A
J.9.3.	**Cycling test**		
	The test is carried out with new copper conductors having a cross sectional area according table 9	_____ mm^2	N/A
	The test is carried out on new samples(a sample is one pole, the number of which is defined below, according the type of terminal		N/A
	- universal terminals for rigid (solid and stranded) and flexible conductors	3 + 3 samples	N/A
	- non-universal terminals for solid conductors only	3 samples	N/A
	-- non- universal terminals for rigid (solid and stranded) conductors	3 + 3 samples	N/A
	- non-universal terminals for flexible conductors only	3 samples	N/A
	The conductors is connected in series as in normal use to each of the three samples as defined on fig. J.1.		N/A
	The sample is provided with a hole or equivalent in order to measured the voltage drop on the terminal		N/A
	The test arrangement is placed in a heating cabinet which is initially on 20°C		N/A
	Except the cooling period the test current (rated current) is applied to the circuit	I test _____ A	N/A

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The samples shall be subjected to 192 temperature cycles, each cycle having a duration of +/- 1 hour		N/A
	Description of the temperature cycle: In 20 min raised to 40°C, maintained for 10 min, then cool down in 20 min to 30 °C, maintained for 10 min. For measurement of the voltage drop it is allowed to cool down to 20 °C		N/A
	The maximum voltage drop, measured on each terminal, at the end of the 192nd cycle, with Inom. shall not exceed the smaller of the two following values - either 22,5 mV - or 1,5 times the value measured after the 24 cycle	Uv max. _____ mV	N/A
	Sample after 24 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 J_2 J_3 _____ _____ _____ _____ _____ _____	N/A
	Sample after 192 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 J_2 J_3 _____ _____ _____ _____ _____ _____	N/A
	After this test the samples shall shown no changes evidently impairing further use, such as cracks, deformations or like		N/A

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict

	Annex K		
	Particular requirements for circuit-breakers with flat quick-connect terminations		
K.6.	**Marking**		
	The whole of clause 6 applies		
	Addition after the lettered item k		
	The following information regarding the female connector according to IEC 61210 and the type of conductor to be used shall be given in the manufacturers instructions		
	l) manufacturers name or trade mark		N/A
	m) type reference		N/A
	n) information on cross-sections of conductors and colour code of insulating female connectors (see table K.1)		N/A
	o) the use of only silver or tin-plated copper alloys		N/A
K.7	**Standard conditions for operation in service**		
	Clause 7 applies		N/A
K.8	**Constructional requirements**		
	Clause 8 applies with the follow modifications:		N/A
	replacement of 8.1.3 by:		N/A
K.8.1	**Clearances and creepage distances (see annex B)**		
	Subclause 8.1.3 applies, the female connectors being fitted to the male tabs of the circuit-breaker		N/A
	Replacement of 8.1.5 by:		N/A
K.8.2	**Terminals for external conductors**		
K.8.2.1	Male tabs and female connectors shall be of a metal having mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use		N/A
K.8.2.2	The nominal width of male tab is 6,3 mm and the thickness 0,8 mm, applicable to rated currents up to and including 16 A NOTE 1:The use for rated currents up to and including 20 A is accepted in BE, FR, IT, PT, ES and US		N/A
	The dimensions of the male tab shall comply with those specified in table K.3 and in figures K.2, K3, K4, K5, where the dimensions A, B, C, D, E, F, J, M, N and Q are mandatory		N/A
	The dimensions of the female connector which may be fitted-on are given in figure K.6 and in table K.4		N/A
	Compliance is checked by inspection and by measurement	See table on page _____	N/A

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
K.8.2.3	**Male tabs shall be securely retained**		
	Compliance is checked by the mechanical overload test of K.9.1		N/A
K.9	**Tests**		
	Clause 9 applies, with follow modifications:		N/A
	Replacement of 9.5		N/A
K.9.1	**Mechanical overload-force**		
	10 terminals of circuit-breakers, mounted as normal use are subjected to a axial push force and successively the axial pull force specified in table K2 applied to male tab once	push force 96 N pull force 88 N	N/A
	No damage which could impair further use shall occur to the tab or to the circuit-breaker in which the tab is integrated		N/A
	Addition to 9.8.3:		N/A
	Fine –wire thermocouples shall be placed in such a way as not to influence the contact or the connection area. An example of placement is shown in fig K.1		N/A

		Dimensions of tabs according Table K.3		Measured in mm	Verdict
		Minimum	Maximum		
A	Dimple	0,7	1,0	———	
	Hole	0,5	1,0	———	
B	Dimple	7,8 min		———	
	Hole	7,8 min		———	
C	Dimple	0,77	0,84	———	
	Hole	0,77	0,84	———	
D	Dimple	6,20	6,40	———	
	Hole	6,20	6,40	———	
E	Dimple	3,6	4,1	———	
	Hole	4,3	4,7	———	
F	Dimple	1,6	2,0	———	
	Hole	1,6	2,0	———	
J	Dimple	8°	12°	———	
	Hole	8°	12°	———	
M	Dimple	2,2	2,5	———	
	Hole	---	---	---	---
N	Dimple	1,8	2,0	———	
	Hole	---	---	---	---
P	Dimple	0,7	1,8	———	
	Hole	0,7	1,8	———	
Q	Dimple	8,9 min	---	———	
	Hole	8,9 min	---	———	
B3			7,8 max	———	
L2			3,5 max	———	

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Annex L		
	Specific requirements for circuit-breakers with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors		
L.6	**Marking**		
	In addition to clause 6 the following apply:		
	Terminal marking according table L.1, on the circuit breaker, near the terminals		N/A
	Conductor types accepted:		
	Copper only	☐ None	N/A
	Aluminium only	☐ "Al"	N/A
	Aluminium and copper	☐ "Al/Cu"	N/A
	Other information concerning the number of conductors, screw torque (if different from table 10) and cross-section shall be indicated on the circuit-breaker	_____ Nm _____ mm²	N/A
L.7	**Standard conditions for operation in service**		
	Clause 7 applies		N/A
L.8	**Constructional requirements**		
	Clause 8 applies with the following exceptions:		
8.1.5.2	*is completed by:*		
	For connection of aluminium conductors, circuit-breakers shall be provided with screw-type terminals allowing the connection of conductors having nominal cross-sections as shown in table L.2		N/A
	Terminals for the connection of aluminium conductors and terminals of aluminium for the connection of copper or aluminium conductors shall have mechanical strength adequate to withstand the tests of 9.4, with the test conductors tightened with the torque indicated in table 10, or with the torque specified by the manufacturer, which shall never be lower than that specified in table 10.		N/A
	Compliance is checked by inspection, by measurement and by fitting in turn one conductor of the smallest and one of the largest cross-section areas as specified		N/A
8.1.5.4	Terminals shall allow the conductors to be connected without special preparation		N/A
	Compliance is checked by inspection and by the tests of L.9		N/A
L.9	**Tests**		

IEC/EN 60 898-1				
Clause	Requirement + Test	Result - Remark		Verdict
	Clause 9 applies with the following modifications/additions:			N/A
	For the tests which are influenced by the material of the terminal and the type of conductor that can be connected, the test conditions of table L.3 are applied			N/A
	Additionally the test of L.9.2 is carried out on terminals separated from the circuit-breaker			N/A
L.9.2	**Current cycling test**			
	This test is carried out on separate terminals			N/A
	The general arrangement of the samples shall be as shown in figure L.1			N/A
	90 % of torque stated by the manufacturer or selected in table 10 used for the specimens	torque:_____Nm		N/A
	The test is carried out with conductors according to table L.5. The length of the test conductor from the point of entry to the screw-type terminal specimens to the equalizer shall be as in table L.6	cross-section:_____mm^2 minimum conductor length:_____mm		N/A
	Cross section of equalizer not greater than that given in table L.7	max. cross-section_____mm^2		N/A
L.9.2.4	Test method and acceptance criteria			
	Test loop subjected to 500 cycles of 1h current-on and 1h current-off, starting at an a.c. current value of 1,12 times the test current value determined in table L.8	test current:_____A		N/A
	Near the end of each current-on period of the first 24 cycles, the current shall subsequently be adjusted to raise the temperature of the reference conductor to 75°C			N/A
	At the end of the 25^{th} cycle the test current shall be adjusted the last time and the stable temperature shall be recorded as the first measurement. No further adjustment of test current for the remainder of the test			N/A
	Temperatures recorded for at least one cycle of each workin day, and after approximately 25, 50, 75, 100, 125, 175, 225, 350, 425 and 500 cycles			N/A
	For each screw-type terminal			N/A
	- the temperature rise shall not exceed 110 K			N/A
	- the stability factor Sf shall not exceed ± 10 °C			N/A
	ambient air temperature: _____°C	max. temperature rise [K]	max. stability factor Sf [°C]	N/A
	Terminal 1			N/A
	Terminal 2			N/A

IEC/EN 60 898-1				
Clause	Requirement + Test	Result - Remark		Verdict
	Terminal 3			N/A
	Terminal 4			N/A
	Terminal 5			N/A
	Terminal 6			N/A
	Terminal 7			N/A
	Terminal 8			N/A

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict

Annex 1

EN 60898-1
COMMON MODIFICATIONS

	GENERAL		
9.12	**Short-circuit tests**		
9.12.2	Value of the power frequency recovery voltage shall be equal to 110 % of the rated voltage.		P
9.12.3	Tolerances on test quantities		
	voltage (including recovery voltage) : 0, -5%		P

	TESTS „A" 1 sample: C63, 1 pole		
6	**MARKING AND OTHER INFORMATION**		
6.1	**Standard marking:**		
	f) Rated short circuit capacity (A):within a rectangle, without symbol "A" ..... :	6000 within a rectangle	P
	h)Calibration temperature, if different from 30°C		N/A
	j) Energy limiting class in a square in accordance with annex ZA, if applied		N/A
	k) Making and breaking capacity on an individual protected pole of multipole circuit-breakers (Icn1), if different from Icn		N/A
6.2	**Additional marking**		
	Additional marking to other standards (EN or IEC or other) is allowed under the follow conditions:		
	- the circuit-breaker shall comply with all the requirements of the additional standard;		
	- the relevant standard to which the additional marking refers shall be indicated adjacent to this marking and shall be clearly differentiated or separated from the standard marking according to cl. 6.1		
	Compliance is checked by inspection and by carrying out all the test sequences required by the relevant standard. Equivalent or less severe test sequences need not be repeated.		N/A
6.3	**Guidance table for marking**		
	Each MCB shall be marked in a durable manner with all or, for small apparatus, according table for marking		P

	TESTS „C" 3 + 3 samples: C63, 1 Pole	C_{1-1}	C_{1-2}	C_{1-3}	

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.11.3	Dielectric strength reduced to 900 V		P

	TESTS „D“ 3 sample: C63, 1 pole				
9.10	**Tests: D_O**	D_{1-1}	D_{1-2}	D_{1-3}	
9.10.2.2	☐ For circuit-breakers of the B – Type				
	Moreover the C.B. shall perform following test:				
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:				
	opening time not less than 1 s or more than		[s]		
	- 60 s				N/A
	- 120 s				N/A
9.10.2.2	☒ For circuit-breakers of the C – Type				
	Moreover the C.B. shall perform following test:				
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	161 A			
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s				N/A
	- 120 s	30	25	27	P
9.10.2.2	☐ For circuit-breakers of the D – Type				
	Moreover the C.B. shall perform following test:				
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	A			
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s				N/A
	- 120 s				N/A

	TESTS „E_3“				
9.12.11.4.4	**Test: E_3 (Test at making and breaking capacity on a individual pole (Icn1)**	E_{3-1}	E_{3-2}	E_{3-3}	
	Service short-circuit capacity ..... :	_____ A			--
	Test circuit: figure..... :	3			--
	Prospective current ..... :	_____ A			--
	Prospective current obtained ..... :	_____ A			--
	Power factor ..... :	_____			--
	Power factor obtained ..... :	_____			--
	Sequence ..... :	O – t –CO 15° 45° 75°			--
	T (min)..... :	_____ min			--

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	"a" = _____ mm	N/A
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm	N/A
	I_{Peak} (A) max. value ..... :	_____ A	--
	$I^2t \leq$ _____ kA^2s	[kA^2s] [kA^2s] [kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 N	___ ----- ---- ---- ___ ---- ---- ----- ---- ---- ---- ----	N/A
	- No permanent arcing		N/A
	- No flash-over between poles or between poles and frame		N/A
	- No blowing of the fuses F and F'		N/A
	- Polyethylene foil shows no holes		N/A
	After the test:		
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.		
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit –breaker is in the open position	E_{3-1} [mA] / E_{3-2} [mA] / E_{3-3} [mA]	
	The leakage current shall not exceed 2 mm L1		N/A
	L2		N/A
	L3		N/A
	L4(N)		N/A
	Electric strength test:		
	Test voltage 900 V (see 9.7.3)		
	a)		N/A
	b)		N/A
	c)		N/A
	d)		N/A
	e) 2000 V		N/A
	Test current 2,8 I_N	_____ A	
	Tripping within > 0,1 s up to	[s] [s] [s]	
	- 60 s		N/A
	- 120 s		N/A

ANNEX C (NORMATIVE)

replace table C.1 by:

Test sequence and number of samples to be submitted for certification purposes
Table C.1 - Test sequences

Test sequence		Clause or subclause	Test (or inspection)
A		6 8.1.1 8.1.2 9.3 8.1.3 8.1.6 9.4 9.5 9.6 9.14 8.1.3 9.15 9.16	Marking General Mechanism Indelibility of marking Clearance and creepage distances (external parts only) Non-interchangeability Reliability of screws, current-carrying parts and connections Reliability of terminals for external conductors Protection against electric shock Resistance to heat Clearances and creepage distances (internal parts) Resistance to abnormal heat and to fire Resistance to rusting
B		9.7 9.8 9.9	Dielectric properties Temperature-rise 28-day test
C	C_1	9.11 9.12.11.2.1 9.12.12	Mechanical and electrical endurance Performance at reduced short-circuit currents Verification of the circuit-breaker after short-circuit tests
	C_2	9.12.11.2.2 9.12.12	Short-circuit test for verifying the suitability of circuit-breakers for use in IT systems Verification of the circuit-breaker after short-circuit tests
D	D_0	9.10	Tripping characteristic
	D_1	9.13 9.12.11.3 9.12.12	Resistance to mechanical shock and impact Short-circuit performance at 1 500 A Verification of circuit-breaker after short-circuit tests
E	E_1	9.12.11.4.2 and 9.12.12	Service short-circuit capacity (I_{cs}) Verification of circuit-breaker after short-circuit tests
	E_2	9.12.11.4.3 and 9.12.12	Performance at rated short-circuit capacity (I_{cn}) Verification of circuit-breaker after short-circuit tests
	E_3	9.12.11.4.4 and 9.12.12	Performance at rated making and breaking capacity (I_{cn1}) on an individual pole of multipole circuit-breakers Verification of circuit-breaker after short-circuit tests
NOTE With the agreement of the manufacturer the same samples may be used for more than one test sequence.			

replace table C.2 by:

Table C.2 - Number of samples for full test procedure

Test sequence		Number of samples	Minimum number of samples which shall pass the test [a) b)]	Maximum number of samples for repeated tests [c)]
A		1	1	--
B		3	2	3
C	C_1	3	2 [e)]	3
	C_2 [f)]	3	2 [e)]	3
D		3	2 [e)]	3
E_1		3 + 4 [d)]	2 [e)] + 2 [d), e)]	3 + 4 [d)]
E_2		3 + 4 [d)]	2 [e)] + 3 [d), e)]	3 + 4 [d)]
E_3		3	2 [e)]	3

a) In total, a maximum of two test sequences may be repeated.

b) It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

c) In the case of repeated tests, all results shall be acceptable.

d) Supplementary samples in the case of single-pole circuit-breakers rated 230/400 V or 240/415 V (see table 1).

e) All samples shall meet the test requirements of 9.12.10, 9.12.11.2, 9.12.11.3 and 9.12.11.4, as appropriate.

f) For this sequence read "number of protected poles" instead of "number of samples". In total a maximum of three test sequences may be repeated.

replace table C.3 by:

Table C.3 - Number of samples for simplified test procedure

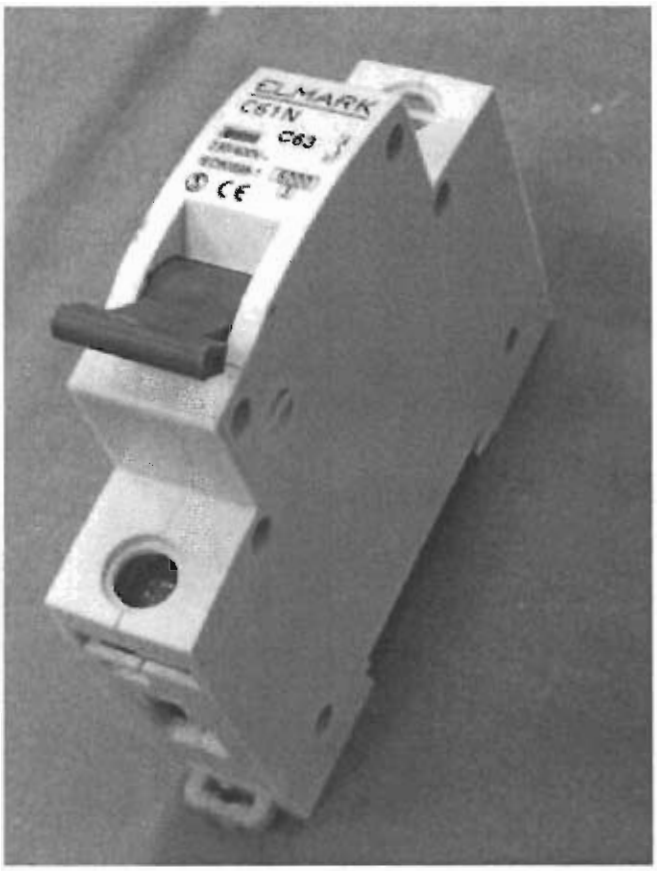
Test sequence		Number of samples depending on number of poles [a]			
		One pole [b]	Two poles [c]	Three poles [d]	Four poles [e]
A		1 max. rated I_N	1 [g),i)] max. rated I_N	1 [i)] max. rated I_N	1 [i)] max. rated I_N
B		3 max. rated I_N	3 [g)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
C	C_1	3 max. rated I_N	3 [g)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
C	C_2	3 max. rated I_N	2 max. rated I_N for 2 protected poles, or 3 max. rated I_N for one protected pole	1 max. rated I_N	1 max. rated I_N
$D_0 + D_1$		3 max. rated I_N	3 [h)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
D_0		1 of all other rated I_N			
E_1		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N
E_2		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N
E_3		[k)]	3 [j)] max. rated I_N	3 [j)] max. rated I_N	3 [j)] max. rated I_N

a) If a test is to be repeated according to the acceptance criteria of C.2, a new set of samples is used for the relevant test sequence. In repeated tests all results shall be satisfactory.
b) If only multipole circuit-breakers are submitted, this column applies to the set of samples having the smallest number of poles (instead of the relevant column).
c) Applicable to two-pole circuit-breakers whether with two protected poles or with one protected pole.
d) This series is omitted when four-pole circuit-breakers are also tested.
e) Also applicable to circuit-breakers with three protected poles and a neutral pole.
f) Supplementary samples in case of single-pole circuit-breakers of 5.3.1.4.
g) This test sequence is omitted when three-pole or four-pole circuit-breakers have been tested.
h) This test sequence shall be omitted for two-pole circuit breakers with two protected poles, when three-pole or four-pole circuit-breakers have been tested.
i) When multipole circuit-breakers are submitted, a maximum of four screw-type terminals for external conductors are subjected to the tests of 9.5, i.e. two supply and two load terminals.
j) If each pole of the multipole is identical to the individual pole tested in E2, this test is omitted. If not this test is carried out on an individual protected pole, taken at random, of the circuit-breaker with the highest number of poles
k) Covered by test sequence E2

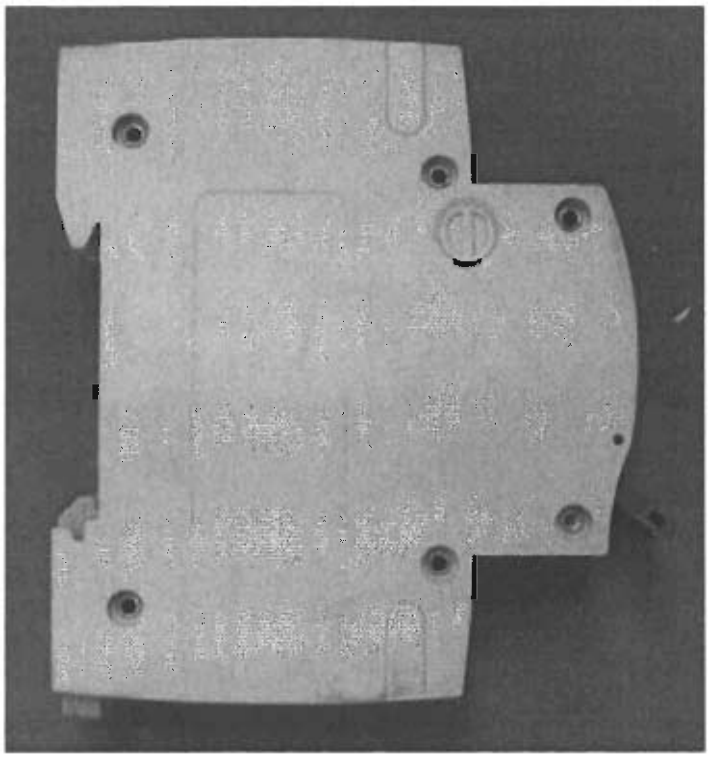
IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict

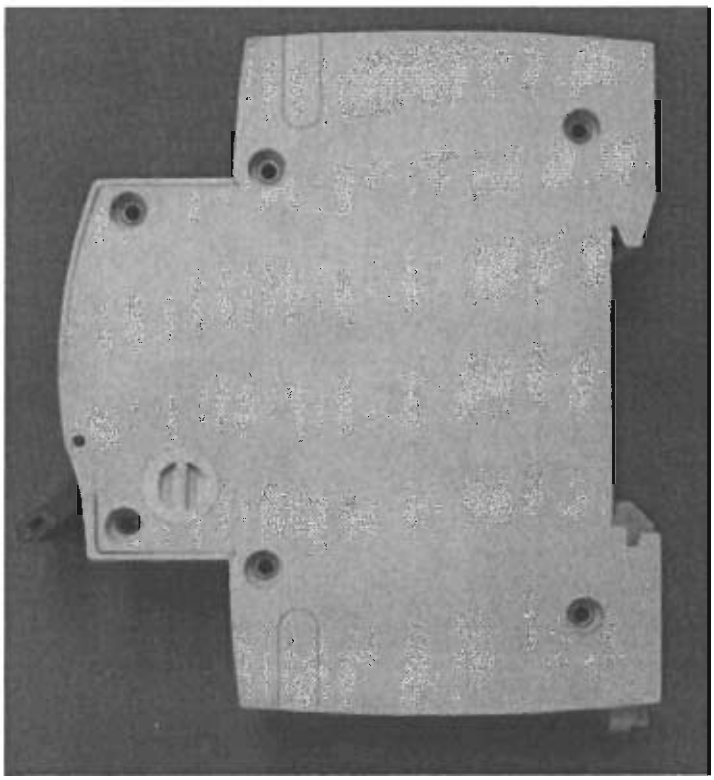
	Annex ZC (normative)	
	EN 60 898-1 **Special national conditions**	
	For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.	
J.1	**Austria, Czech Republic, Denmark, Germany, Netherlands, Norway and Switzerland**	
	The upper limit of current for use of screw less terminals is 16 A	N/A
J.3.3	**Austria, Belgium, Denmark, France, Germany, Italy, Portugal, Spain, Sweden, Switzerland, and United Kingdom**	
	Only universal screwless type terminals are accepted.	N/A
K1	**BELGIUM, FRANCE, ITALY, PORTUGAL, SPAIN, AND UNITED KINGDOM**	
	The use of circuit-breakers with flat quick-connect terminations for rated currents up to and including 20 A is accepted.	N/A
K.8.2.2	**BELGIUM, FRANCE, ITALY, PORTUGAL, SPAIN, AND UNITED KINGDOM**	
	The use for rated currents up to and including 20 A	N/A

Photos of samples:

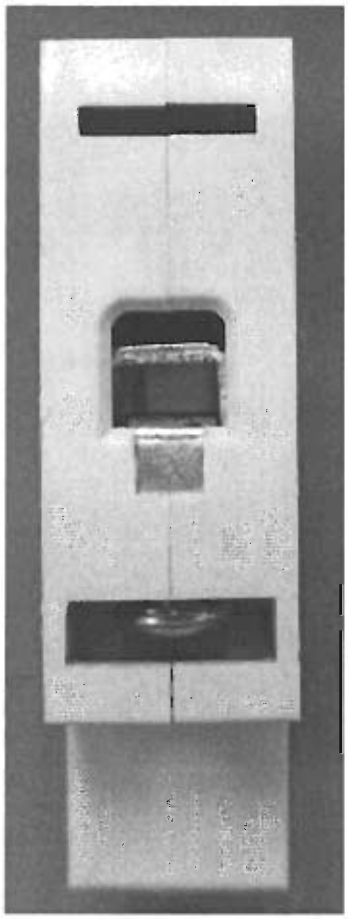


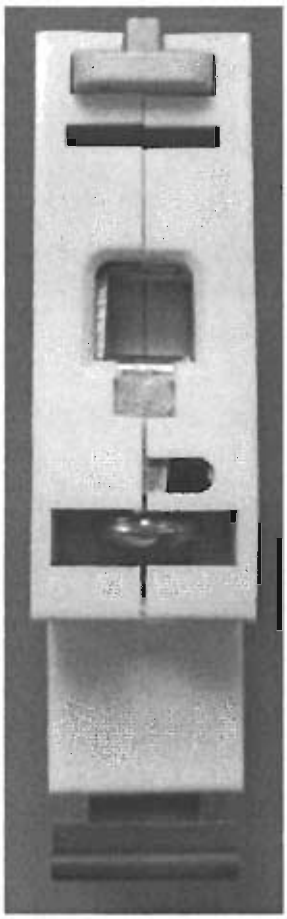
Photos of samples:



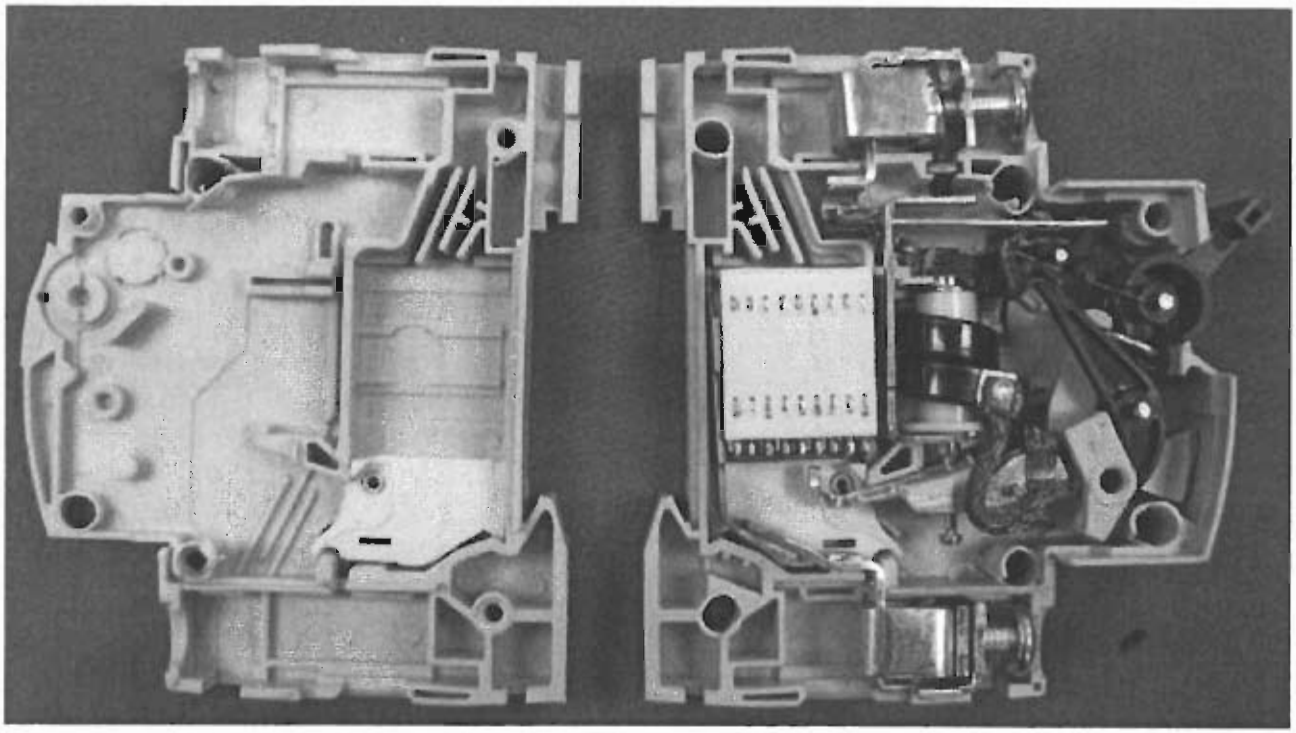


Photos of samples:





Photos of samples:



Test Report issued under the responsibility of:

TEST REPORT
IEC/EN 60898-1
Circuit-breakers for over current protection for household and similar installations

Report Reference No. ..... :	130700021SHA-002
Date of issue ..... :	October 12, 2013
Total number of pages	14
CB/CCA Testing Laboratory ..... :	Intertek Testing Services Shanghai
Address ..... :	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Applicant's name ..... :	ELMARK INDUSTRIES SC
Address ..... :	2 Dobrudzha blvd., Dobrich, Bulgaria
Test specification:	
Standard ..... :	☒ IEC 60898-1:2002 (1st Edition) + A1:2002 + A2:2003 and/or ☒ EN 60898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012
Test procedure ..... :	CB & S
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IECEN60898_1C
Test Report Form(s) Originator ..... :	OVE
Master TRF ..... :	Dated 2007-12

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

If this Test Report Form is used by non-CCA members, the CIG logo and the reference to the CCA Procedure shall be removed.

This report is not valid as a CCA Test Report unless signed by an approved CCA Testing Laboratory and appended to a CCA Test Certificate issued by an NCB in accordance with CCA

Test item description ..... :	Circuit-breakers with overcurrent protection
Trade Mark ..... :	ELMARK
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	C62N
Ratings ..... :	U_e= 400V~(2P)
	I_n= 1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

Testing procedure and testing location:	
☒ **CB/CCA Testing Laboratory**:	Intertek Testing Services Shanghai
Testing location/ address .....:	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
☒ **Associated CB Laboratory:**	Inspection Center of Products' Quality of Low Voltage Electric Apparatus in Zhejiang Province
Testing location/ address .....:	West Zhonghuan Road, Jiaxing City, Zhejiang Province, P.R.China
Tested by (name + signature) .....:	Allen Wang
Approved by (+ signature).....:	Jim Hua
☐ Testing procedure: TMP	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: WMT	
Tested by (name + signature) .....:	
Witnessed by (+ signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: SMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	
☐ Testing procedure: RMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	

Summary of testing:

The products comply with the requirements of IEC 60 898-1:2002 (1st Edition) + A1:2002 + A2:2003 and EN 60 898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012

Clause	Testing items	Testing location
6	Marking and other product information	CBTL
8.1.1	General	CBTL
8.1.2	Mechanism	CBTL
8.1.3	Clearances and creepage distances	CBTL
8.1.6	Non-interchangeability	CBTL
9.3	Test of Indelibility of marking	CBTL
9.4	Test of reliability of screws, current-carrying parts and connections.	CBTL
9.5	Reliability of terminals for external conductors	CBTL
9.6	Test of protection against electric shock	CBTL
9.7	Test of dielectric properties	
9.7.1	Resistance to humidity	CBTL
9.7.2	Insulation resistance of the main circuit	CBTL
9.7.3~9.7.6	Dielectric strength	CBTL
9.8	Test of temperature-rise	ACTL
9.9	28-days test	ACTL
9.10	Tripping characteristic	ACTL
9.11	Mechanical and electrical endurance	ACTL
9.12	short circuit	ACTL
9.13	Resistance to mechanical shock and impact	CBTL
9.14	Resistance to heat	CBTL
9.15	Resistance to abnormal heat and to fire	CBTL
9.16	Resistance to rust	CBTL

Summary of compliance with National Differences:

Copy of marking plate:

Test item particulars	
Type of circuit-breaker ..... :	C62N
Number of poles ..... :	☐ 1-P ☐ 1-P+N ☒ 2-P ☐ 3-P ☐ 3-P+N ☐ 4-P ☐ Other .....
Protection against external influences ..... :	☐ enclosed ☒ unenclosed
Method of mounting ..... :	☐ surface ☒ flush ☒ panel board / distribution board
Method of connection ..... :	☐ not associated with the mechanical mounting ☒ associated with the mechanical mounting
Instantaneous tripping current ..... :	☐ B ☒ C ☐ D
Ambient air temperature (°C) ..... :	☒ 30°C ☐ 40°C ☐ Other _____°C
Energy limiting class ..... :	☐ Class 1 ☐ Class 2 ☐ Class 3
Rated short-circuit capacity (A) ..... :	☐ 1,5 kA ☐ 3 kA ☐ 4,5 kA ☒ 6 kA ☐ 10 kA ☐ 7,5 kA ☐ 20 kA ☐ 25 kA
Type of terminal ..... :	☐ screw [a) b)] ☒ pillar [a) b)] ☐ cage [a) b)] ☐ lug ☐ screw less [a)] ☐ flat quick connect [a)] ☐ plug-in ☐ screw-in [a)] copper conductors [b)] aluminium conductors***
Value of rated operational voltage ..... :	☐ 120 V ** ☐ 230 V ☐ 240 V ** ☐ 120/240 V ** ☐ 230/400 V ☒ 400 V ☐ 240/415 V ☐ 415 V
Value of rated current ..... :	1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A
Value of rated frequency ..... :	☒ 50 Hz ☒ 60 Hz
Rated impulse withstand voltage (Uimp)	☐ 2,5 kV** ☒ 4 kV ☐ declared ___kV
Material group and CTI declared by manufacturer	☐ Group I, (600 V ≤ CTI) ☐ Group II, (400 V ≤ CTI < 600 V) ☒ Group IIIa, (175 V ≤ CTI < 400 V)

Remark:
** delete for EN and *** only for EN

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Note: This TRF includes EN Group Differences together with National Differences and Special National Conditions, if any. All Differences are located in the Appendix to the main body of this TRF.

Throughout this report a ☒ comma or ☐ point is used as the decimal separator.

The basic part of this test report covers the evaluation of the IEC requirements.

Annex 1 of this test report covers the evaluation of the CENELEC common modifications.

This test report is valid only being read together with the test reports of 130700021SHA-001, -003,-004

Factory: ELMARK INDUSTRIES SC / 2 Dobrudzha blvd., Dobrich, Bulgaria

General product information:

C62N

Ue=400V~, 2P, C Type

I_n= 1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

Icn=Ics=6kA, Uimp=4kV, 50/60Hz

Number of tests for simplified test procedure, according to table C.3 and C.4

Report ref.No	No. of poles	In(A)	Type	Test sequence and number of samples								
				A	B	C1	C2	D0+D1	D0	E1	E2	E3 [b)]
130700021 SHA-001	1P	63	C	x	x	x	x	x	-	x	-	-
	1P	50	C	-	-	-	-	-	x[a)]	-	-	-
	1P	40	C	-	-	-	-	-	x[a)]	-	-	-
	1P	32	C	-	-	-	-	-	x[a)]	-	-	-
	1P	25	C	-	-	-	-	-	x[a)]	-	-	-
	1P	20	C	-	-	-	-	-	x[a)]	-	-	-
	1P	16	C	-	-	-	-	-	x[a)]	-	-	-
	1P	10	C	-	-	-	-	-	x[a)]	-	-	-
	1P	6	C	-	-	-	-	-	x[a)]	-	-	-
	1P	4	C	-	-	-	-	-	x[a)]	-	-	-
	1P	2	C	-	-	-	-	-	x[a)]	-	-	-
	1P	1	C	-	-	-	-	-	x[a)]	x	-	-
130700021 SHA-002	2P	63	C	-	-	-	x	-	-	x	-	-
	2P	1	C	-	-	-	-	-	-	x	-	-
130700021 SHA-003	-	-	-	-	-	-	-	-	-	-	-	-
130700021 SHA-004	4P	63	C	x	x	x	x	x	-	x	-	-
	4P	1	C	-	-	-	-	-	-	x	-	-

Note:
a): For this test sequence only test of clause 9.10.2 is required according to table C.4.
b):Test sequence in EN 60898-1, due to Icn1=Icn, the test sequence is omitted.

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „C" 2 samples: C63, 2 poles			
9.12.11.2.2	**Test C_2 : Short-circuit test on circuit-breakers rated 230 V, or 240 V or 230/400 V for verifying for use in IT systems**			
	Test current:	Obtained		
	- 500 A or 1,2 times the upper limit of the standard	I_{test}= 762A		P
	Test voltage 1,05 Un	U_{test}= 436V		P
	Power factor 0,93-0,98	0,97		P
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 35 mm		P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm		N/A
	I_{Peak} (kA) max. value	1,07		P
	Sequence: "O" + "CO" on each protected pole	[kA^2s]	[kA^2s]	
	Shifted point 30 ° on the other protected pole	**C_{2-1}**	**C_{2-2}**	
	Max. $I^2t \leq$ _____kA^2s L1	4,96	5,68	P
	L2	5,73	4,64	
	L3	–	–	
	L4	–	–	
	- No permanent arcing			P
	- No flash-over between poles or between poles and frame			P
	- No blowing of the fuses F and F'			P
	- Polyethylene foil shows no holes			P
	After the test:			
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**			
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times U_n.= 440V. The circuit –breaker is in the open position	**C_{2-1}** [mA] $x10^{-3}$	**C_{2-2}** [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,38	6,36	P
	L2	6,36	6,29	P
	L3	-	-	N/A
	L4(N)	-	-	N/A
	Electric strength test:			
	Test voltage 1500 V (see 8.7.2)			
	a)			P
	b)			P
	c)			P

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	d)		N/A
	e) 2000 V		N/A

	TESTS „E" 3 Samples **) SEE ANNEX 1* **: C63, 2 poles**				
8.12.11.4.2	**Test: E_1 ;Test at service short-circuit capacity**	**E_{1-1}**	**E_{1-2}**	**E_{1-3}**	
	Service short-circuit capacity ..... :	6000A			
	Test circuit: figure ..... :	Figure 4b			
	Prospective current ..... :	6000A			
	Prospective current obtained ..... :	$6{,}02 \times 10^3$A			
	Power factor ..... :	0,65~0,70			
	Power factor obtained ..... :	0,67			
	Sequence ..... :	O - O - CO			
	T (min) ..... :	3min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value ..... :	4,88			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA2s L1	80,0	41,7	35,3	P
	L2	80,0	41,7	35,3	
	L3	–	–	–	
	L4(N)	–	–	–	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times U_n.= 440V. The circuit –breaker is in the open position	**E_{1-1}** [mA] $x10^{-3}$	**E_{1-2}** [mA] $x10^{-3}$	**E_{1-3}** [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,54	6,71	6,15	P
	L2	6,23	6,96	6,37	P
	L3	-	-	-	N/A

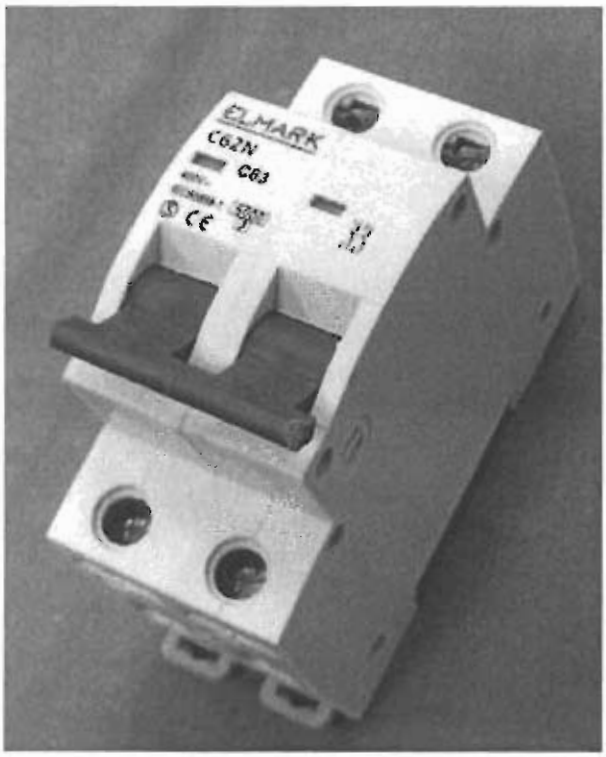
IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict

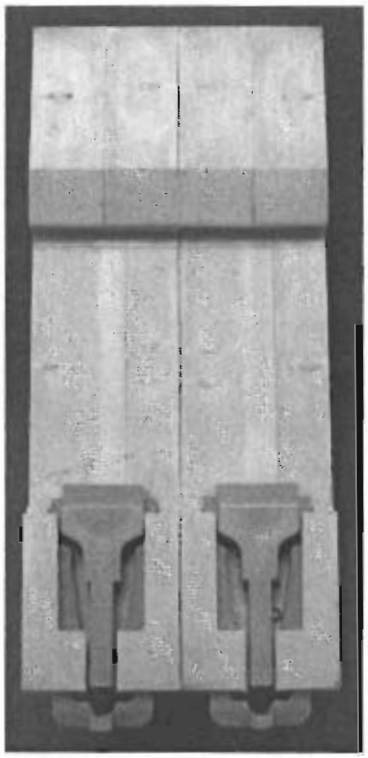
	L4(N)	-	-	-	N/A
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non tripping current (1,13 I_N)	60,6A			
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			
		E_{1-1} [s]	E_{1-2} [s]	E_{1-3} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	103	121	86	P

	TESTS „E" 3 Samples **) SEE ANNEX 1* **: C1,2 poles**				
8.12.11.4.2	**Test: E_1 : Test at service short-circuit capacity**	E_{1-4}	E_{1-5}	E_{1-6}	
	Service short-circuit capacity ..... :	6000A			
	Test circuit: figure ..... :	Figure 4b			
	Prospective current ..... :	6000A			
	Prospective current obtained ..... :	$6,02x10^3$A			
	Power factor ..... :	0,65~0,70			
	Power factor obtained ..... :	0,67			
	Sequence ..... :	O - O - CO			
	T (min) ..... :	3min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value ..... :	0,412			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s L1	0,355	0,467	0,346	P
	L2	0,355	0,467	0,346	
	L3	—	—	—	
	L4(N)	—	—	—	

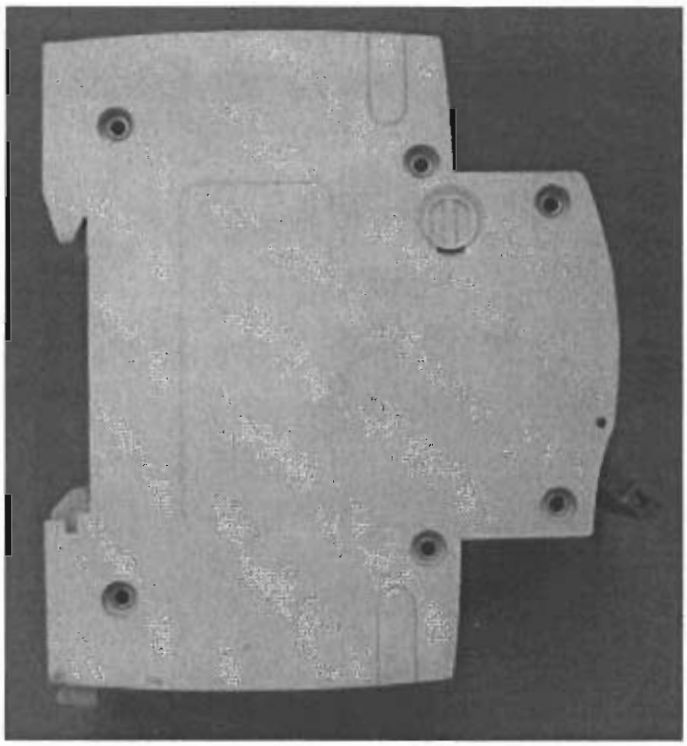
IEC/EN 60 898-1					
Clause	Requirement + Test	Result - Remark			Verdict
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times U_n.= 440V. The circuit –breaker is in the open position	E_{1-4} [mA] $x10^{-3}$	E_{1-5} [mA] $x10^{-3}$	E_{1-6} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,94	6,84	7,03	P
	L2	6,89	6,83	6,84	P
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non tripping current (1,13 I_N)	0,97A			
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	1,60A			
		E_{1-4} [s]	E_{1-5} [s]	E_{1-6} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	158	107	69	P

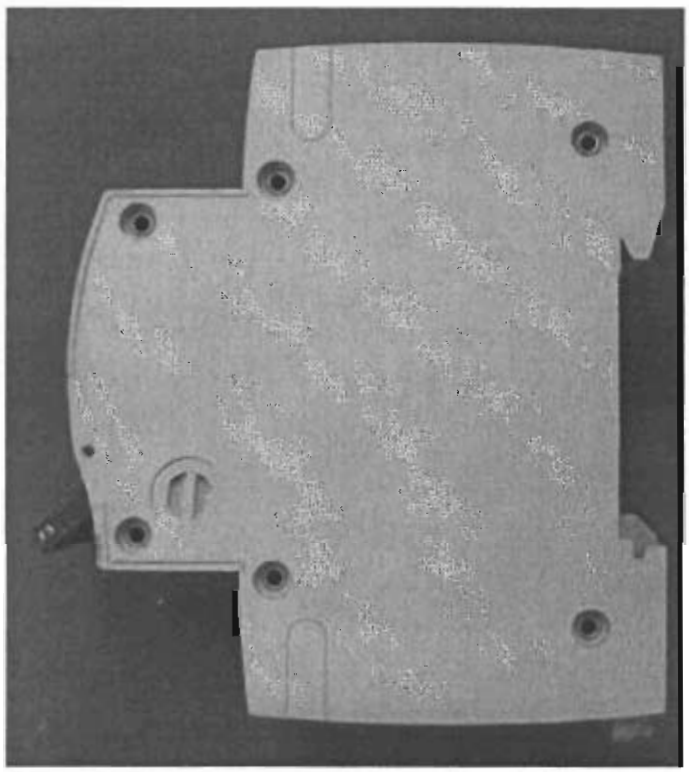
Photos of samples: 2P



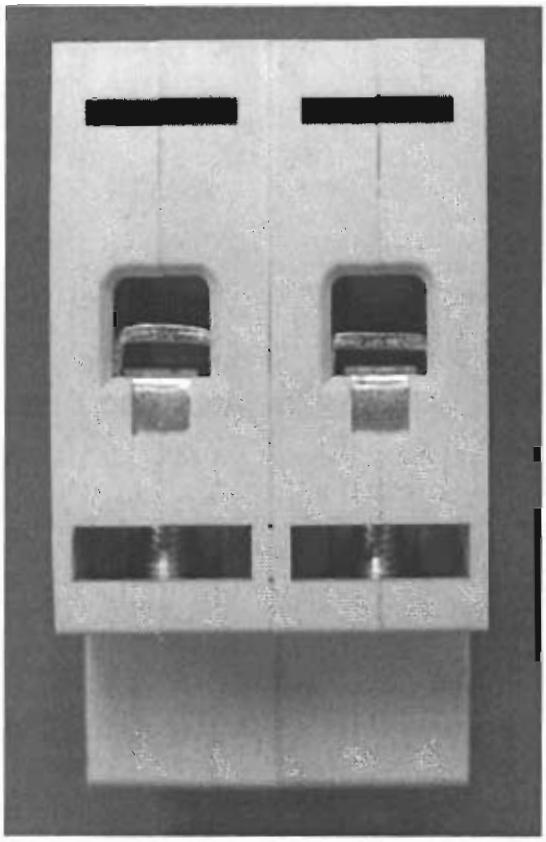


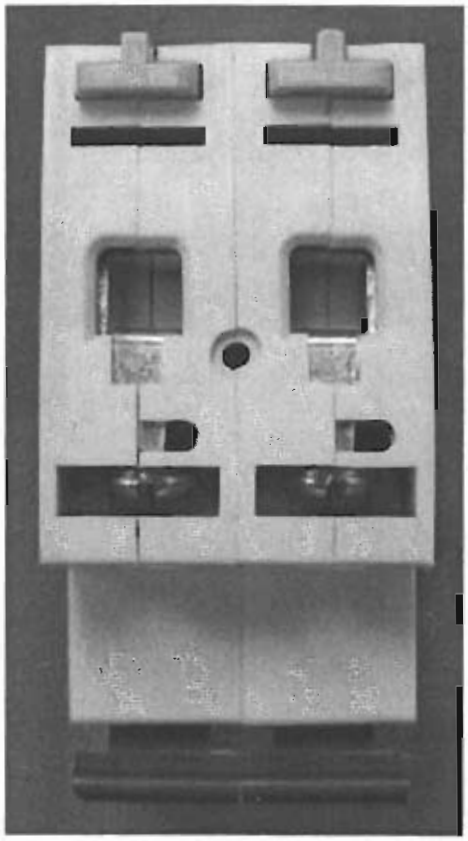
Photos of samples: 2P





Photos of samples: 2P





Test Report issued under the responsibility of:

TEST REPORT
IEC/EN 60898-1
Circuit-breakers for over current protection for household and similar installations

Report Reference No. ..... :	130700021SHA-003
Date of issue ..... :	October 12, 2013
Total number of pages	10
CB/CCA Testing Laboratory ..... :	Intertek Testing Services Shanghai
Address ..... :	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Applicant's name ..... :	ELMARK INDUSTRIES SC
Address ..... :	2 Dobrudzha blvd., Dobrich, Bulgaria
Test specification:	
Standard ..... :	☒ IEC 60898-1:2002 (1st Edition) + A1:2002 + A2:2003 and/or ☒ EN 60898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012
Test procedure ..... :	CB & S
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IECEN60898_1C
Test Report Form(s) Originator ..... :	OVE
Master TRF ..... :	Dated 2007-12

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

If this Test Report Form is used by non-CCA members, the CIG logo and the reference to the CCA Procedure shall be removed.

This report is not valid as a CCA Test Report unless signed by an approved CCA Testing Laboratory and appended to a CCA Test Certificate issued by an NCB in accordance with CCA

Test item description ..... :	Circuit-breakers with overcurrent protection
Trade Mark ..... :	ELMARK
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	C63N
Ratings ..... :	U_e= 400V~, 3P I_n=1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

Testing procedure and testing location:	
☒ **CB/CCA Testing Laboratory:**	Intertek Testing Services Shanghai
Testing location/ address .....:	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
☒ **Associated CB Laboratory:**	Inspection Center of Products' Quality of Low Voltage Electric Apparatus in Zhejiang Province
Testing location/ address .....:	West Zhonghuan Road, Jiaxing City, Zhejiang Province, P.R.China
Tested by (name + signature) .....:	Allen Wang
Approved by (+ signature).....:	Jim Hua
☐ Testing procedure: TMP	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: WMT	
Tested by (name + signature) .....:	
Witnessed by (+ signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: SMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	
☐ Testing procedure: RMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	

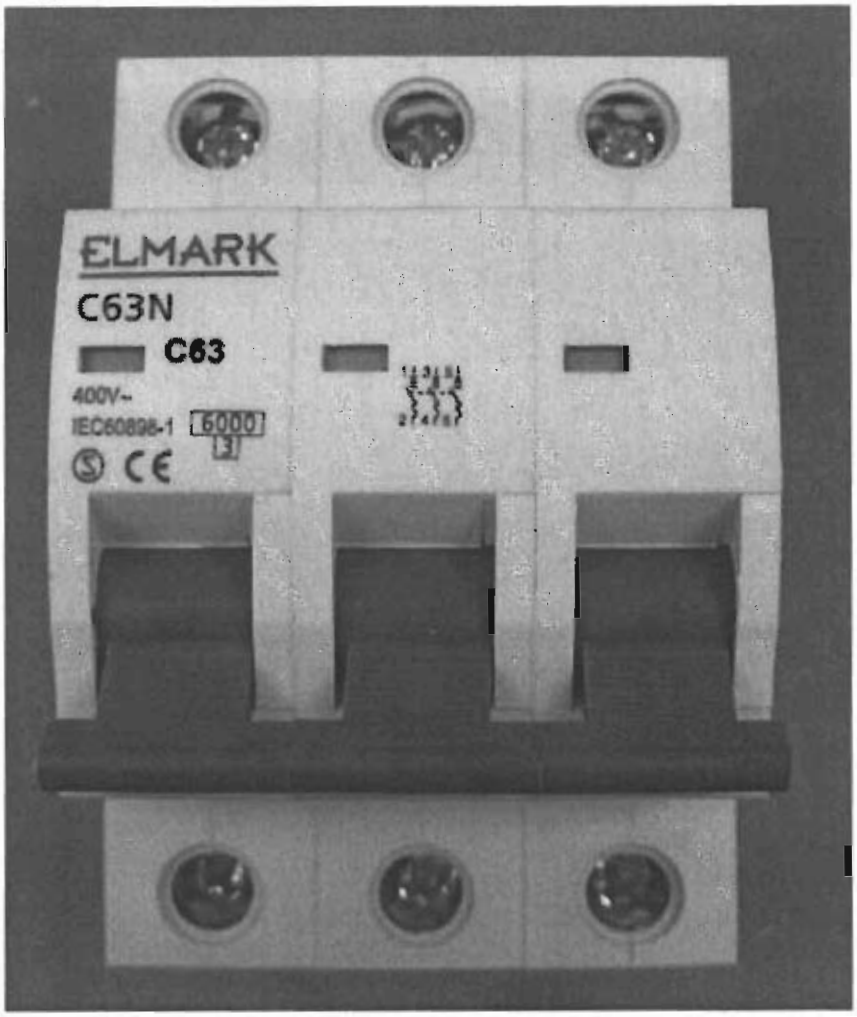
Summary of testing:

The products comply with the requirements of IEC 60 898-1:2002 (1st Edition) + A1:2002 + A2:2003 and EN 60 898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012

Clause	Testing items	Testing location
6	Marking and other product information	CBTL
8.1.1	General	CBTL
8.1.2	Mechanism	CBTL
8.1.3	Clearances and creepage distances	CBTL
8.1.6	Non-interchangeability	CBTL
9.3	Test of Indelibility of marking	CBTL
9.4	Test of reliability of screws, current-carrying parts and connections.	CBTL
9.5	Reliability of terminals for external conductors	CBTL
9.6	Test of protection against electric shock	CBTL
9.7	Test of dielectric properties	
9.7.1	Resistance to humidity	CBTL
9.7.2	Insulation resistance of the main circuit	CBTL
9.7.3~9.7.6	Dielectric strength	CBTL
9.8	Test of temperature-rise	ACTL
9.9	28-days test	ACTL
9.10	Tripping characteristic	ACTL
9.11	Mechanical and electrical endurance	ACTL
9.12	short circuit	ACTL
9.13	Resistance to mechanical shock and impact	CBTL
9.14	Resistance to heat	CBTL
9.15	Resistance to abnormal heat and to fire	CBTL
9.16	Resistance to rust	CBTL

Summary of compliance with National Differences:

Copy of marking plate:



Test item particulars	
Type of circuit-breaker ..... :	C63N
Number of poles ..... :	☐ 1-P ☐ 1-P+N ☐ 2-P ☒ 3-P ☐ 3-P+N ☐ 4-P ☐ Other .....
Protection against external influences ..... :	☐enclosed ☒ unenclosed
Method of mounting ..... :	☐surface ☒ flush ☒ panel board / distribution board
Method of connection ..... :	☐.not associated with the mechanical mounting ☒ associated with the mechanical mounting
Instantaneous tripping current ..... :	☐B ☒ C ☐ D
Ambient air temperature (°C) ..... :	☒ 30°C ☐ 40°C ☐ Other _____°C
Energy limiting class ..... :	☐ Class 1 ☐ Class 2 ☐ Class 3
Rated short-circuit capacity (A) ..... :	☐ 1,5 kA ☐ 3 kA ☐ 4,5 kA ☒ 6 kA ☐ 10 kA ☐ 7,5 kA ☐ 20 kA ☐ 25 kA
Type of terminal ..... :	☐ screw [a) b)] ☒ pillar [a) b)] ☐ cage [a) b)] ☐ lug ☐ screw less [a)] ☐ flat quick connect [a)] ☐ plug-in ☐ screw-in [a)] copper conductors [b)] aluminium conductors***
Value of rated operational voltage ..... :	☐ 120 V ** ☐ 230 V ☐ 240 V ** ☐ 120/240 V ** ☐ 230/400 V ☒ 400 V ☐ 240/415 V ☐ 415 V
Value of rated current ..... :	1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A
Value of rated frequency ..... :	☒ 50 Hz ☒ 60 Hz
Rated impulse withstand voltage (Uimp)	☐ 2,5 kV** ☒ 4 kV ☐ declared ___kV
Material group and CTI declared by manufacturer	☐ Group I, (600 V ≤ CTI) ☐ Group II, (400 V ≤ CTI < 600 V) ☒ Group IIIa, (175 V ≤ CTI < 400 V)

Remark:

** delete for EN and *** only for EN

General remarks:

The test results presented in this report relate only to the object tested.
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"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Note: This TRF includes EN Group Differences together with National Differences and Special National Conditions, if any. All Differences are located in the Appendix to the main body of this TRF.

Throughout this report a ☒ comma or ☐ point is used as the decimal separator.

The basic part of this test report covers the evaluation of the IEC requirements.

Annex 1 of this test report covers the evaluation of the CENELEC common modifications.

This test report is valid only being read together with the test reports of 130700021SHA-001, -002,-004

Factory: ELMARK INDUSTRIES SC / 2 Dobrudzha blvd., Dobrich, Bulgaria

General product information:

C63N

Ue=400V~, 3P, C Type

In=1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

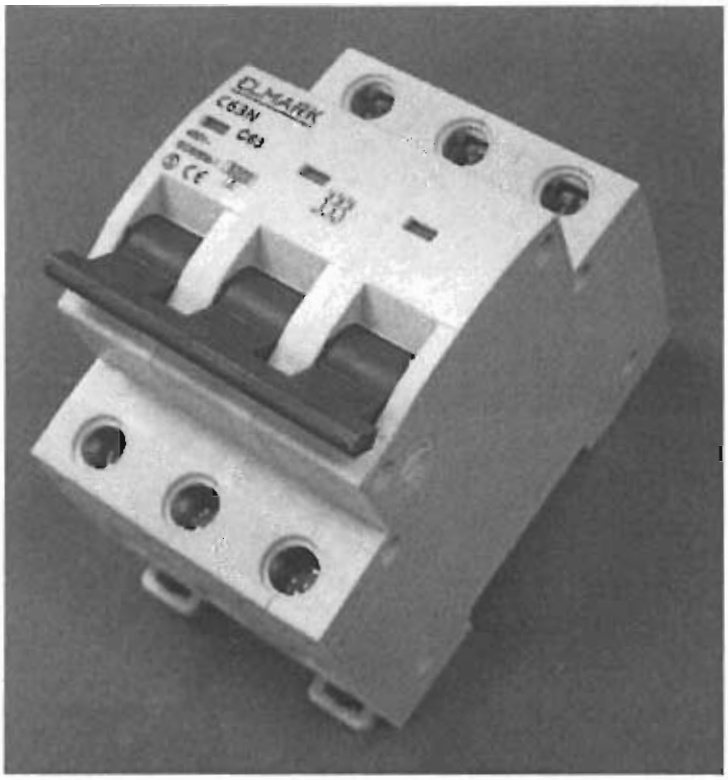
Icn=Ics=6kA, Uimp=4kV, 50/60Hz

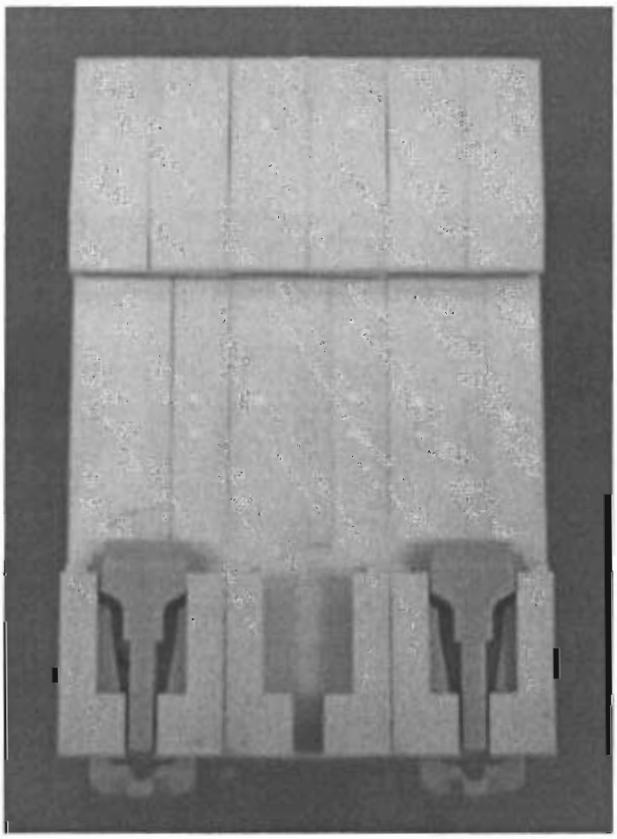
Number of tests for simplified test procedure, according to table C.3 and C.4

Report ref.No	No. of poles	In(A)	Type	Test sequence and number of samples								
				A	B	C1	C2	D0+D1	D0	E1	E2	E3 [b]
130700021 SHA-001	1P	63	C	x	x	x	x	x	-	x	-	-
	1P	50	C	-	-	-	-	-	x[a]	-	-	-
	1P	40	C	-	-	-	-	-	x[a]	-	-	-
	1P	32	C	-	-	-	-	-	x[a]	-	-	-
	1P	25	C	-	-	-	-	-	x[a]	-	-	-
	1P	20	C	-	-	-	-	-	x[a]	-	-	-
	1P	16	C	-	-	-	-	-	x[a]	-	-	-
	1P	10	C	-	-	-	-	-	x[a]	-	-	-
	1P	6	C	-	-	-	-	-	x[a]	-	-	-
	1P	4	C	-	-	-	-	-	x[a]	-	-	-
	1P	2	C	-	-	-	-	-	x[a]	-	-	-
	1P	1	C	-	-	-	-	-	x[a]	x	-	-
130700021 SHA-002	2P	63	C	-	-	-	x	-	-	x	-	-
	2P	1	C	-	-	-	-	-	-	x	-	-
130700021 SHA-003	-	-	-	-	-	-	-	-	-	-	-	-
130700021 SHA-004	4P	63	C	x	x	x	x	x	-	x	-	-
	4P	1	C	-	-	-	-	-	-	x	-	-

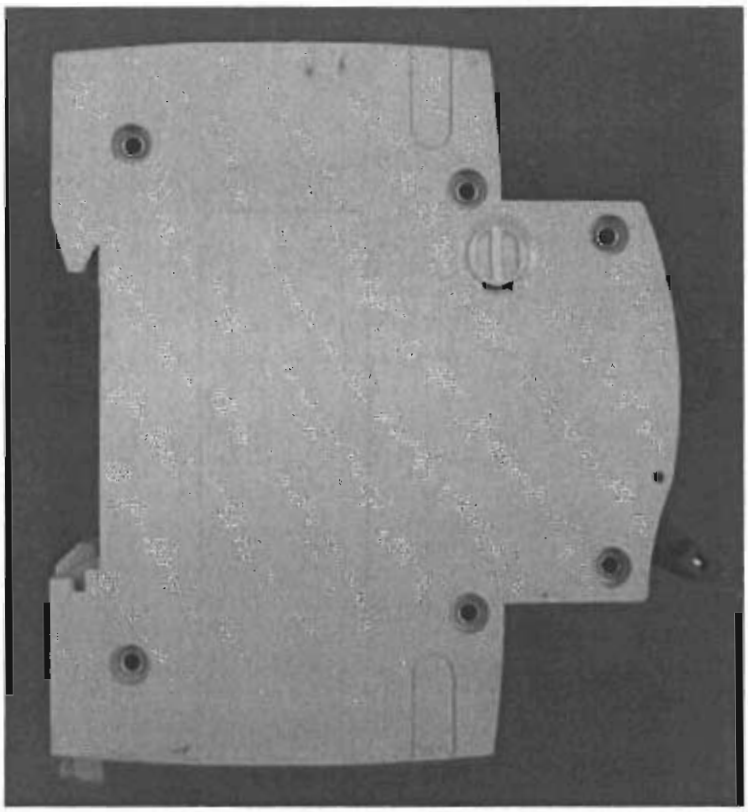
Note:
a): For this test sequence only test of clause 9.10.2 is required according to table C.4.
b):Test sequence in EN 60898-1, due to Icn1=Icn, the test sequence is omitted.

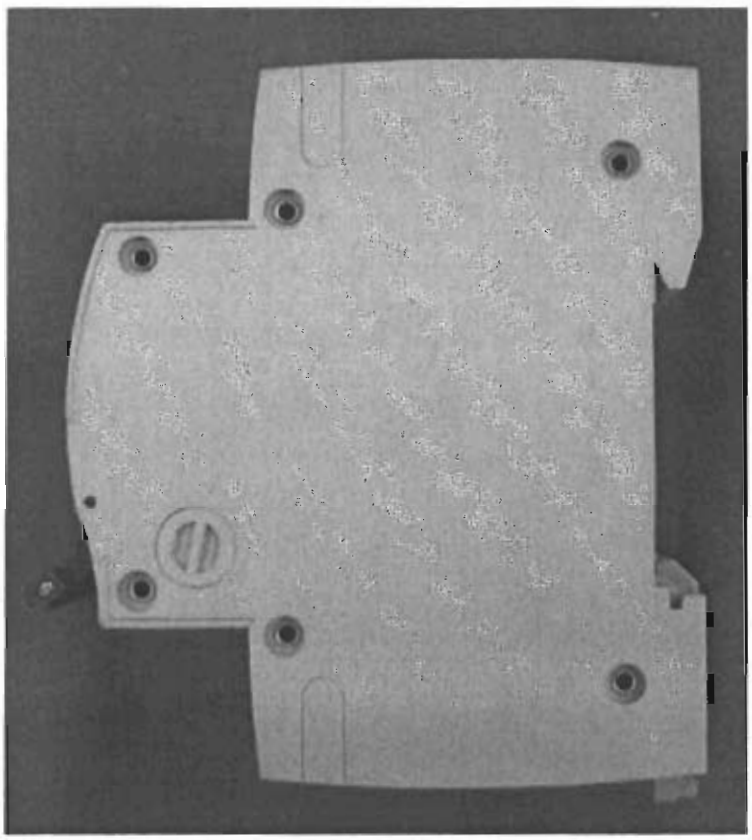
Photos of samples:



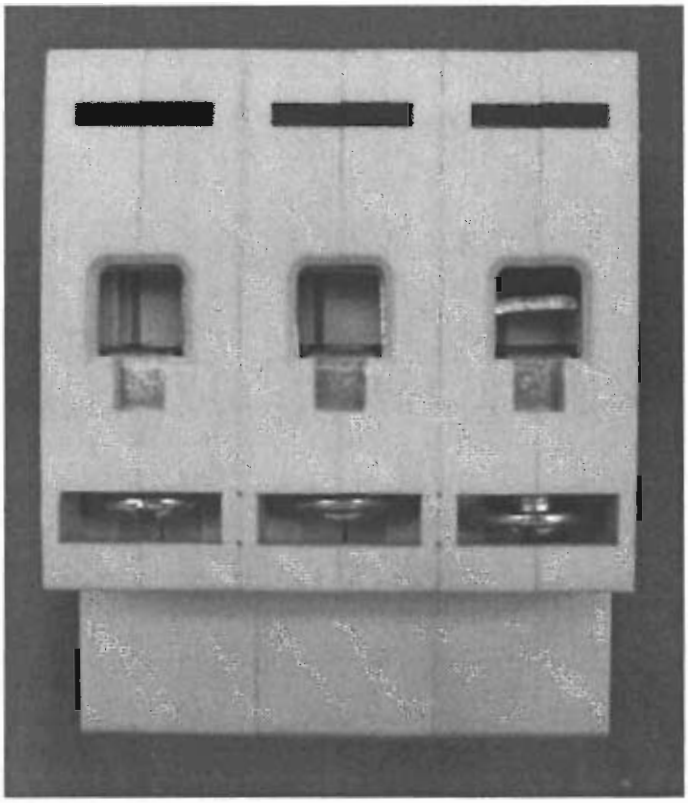


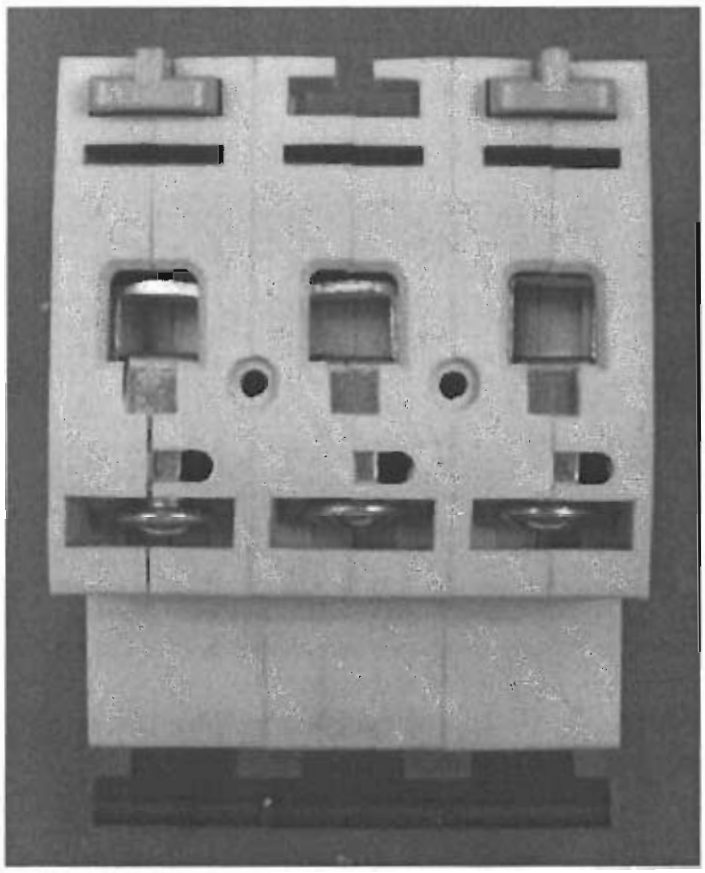
Photos of samples:





Photos of samples:





Test Report issued under the responsibility of:

Intertek

TEST REPORT
IEC/EN 60898-1
Circuit-breakers for over current protection for household and similar installations

Report Reference No. ..... :	130700021SHA-004
Date of issue ..... :	October 12, 2013
Total number of pages	54
CB/CCA Testing Laboratory ..... :	Intertek Testing Services Shanghai
Address ..... :	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Applicant's name ..... :	ELMARK INDUSTRIES SC
Address ..... :	2 Dobrudzha blvd., Dobrich, Bulgaria
Test specification:	
Standard ..... :	☒ IEC 60898-1:2002 (1st Edition) + A1:2002 + A2:2003 and/or ☒ EN 60898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012
Test procedure ..... :	CB & S
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IECEN60898_1C
Test Report Form(s) Originator ..... :	OVE
Master TRF ..... :	Dated 2007-12

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

If this Test Report Form is used by non-CCA members, the CIG logo and the reference to the CCA Procedure shall be removed.

This report is not valid as a CCA Test Report unless signed by an approved CCA Testing Laboratory and appended to a CCA Test Certificate issued by an NCB in accordance with CCA

Test item description ..... :	Circuit-breakers with overcurrent protection
Trade Mark ..... :	ELMARK
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	C64N
Ratings ..... :	U_e= 400V~(4P) I_n=1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

Testing procedure and testing location:	
☒ **CB/CCA Testing Laboratory**:	Intertek Testing Services Shanghai
Testing location/ address .....:	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
☒ **Associated CB Laboratory:**	Inspection Center of Products' Quality of Low Voltage Electric Apparatus in Zhejiang Province
Testing location/ address .....:	West Zhonghuan Road, Jiaxing City, Zhejiang Province, P.R.China
Tested by (name + signature) .....:	Allen Wang
Approved by (+ signature).....:	Jim Hua
☐ Testing procedure: TMP	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: WMT	
Tested by (name + signature) .....:	
Witnessed by (+ signature) .....:	
Approved by (+ signature).....:	
Testing location/ address .....:	
☐ Testing procedure: SMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	
☐ Testing procedure: RMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address .....:	

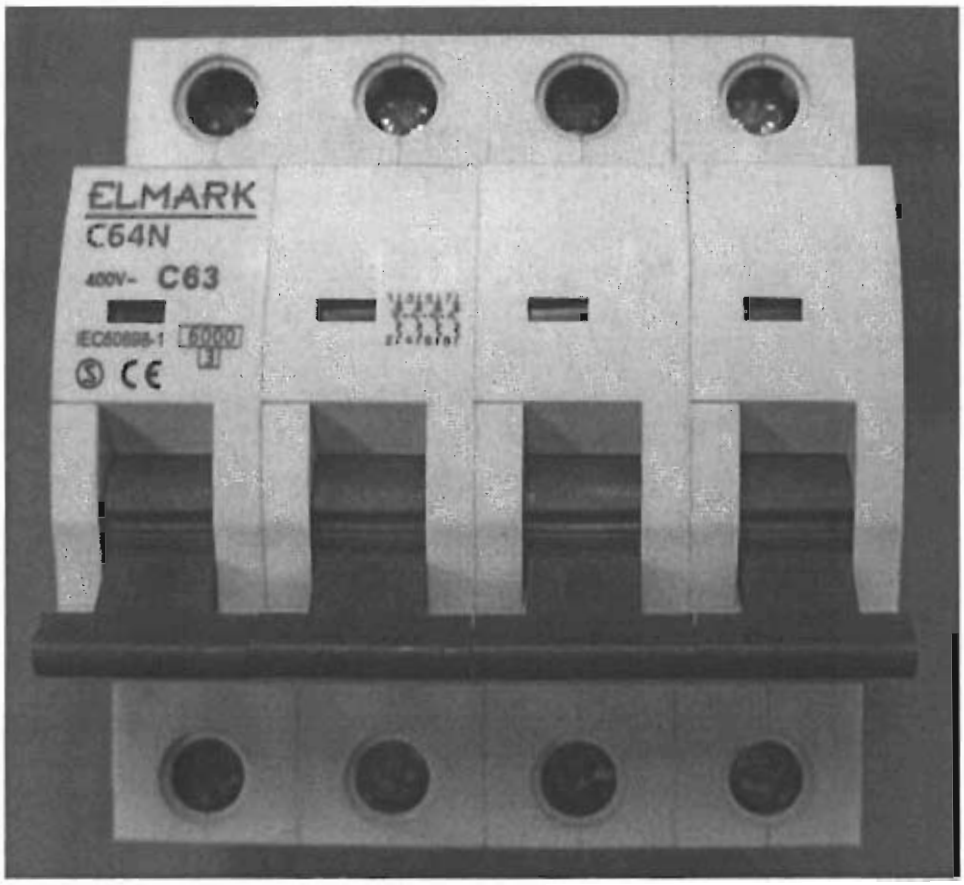
Summary of testing:

The products comply with the requirements of IEC 60 898-1:2002 (1st Edition) + A1:2002 + A2:2003 and EN 60 898-1:2003 + A1:2004 + A11:2005+A12:2008+A13:2012

Clause	Testing items	Testing location
6	Marking and other product information	CBTL
8.1.1	General	CBTL
8.1.2	Mechanism	CBTL
8.1.3	Clearances and creepage distances	CBTL
8.1.6	Non-interchangeability	CBTL
9.3	Test of Indelibility of marking	CBTL
9.4	Test of reliability of screws, current-carrying parts and connections.	CBTL
9.5	Reliability of terminals for external conductors	CBTL
9.6	Test of protection against electric shock	CBTL
9.7	Test of dielectric properties	
9.7.1	Resistance to humidity	CBTL
9.7.2	Insulation resistance of the main circuit	CBTL
9.7.3~9.7.6	Dielectric strength	CBTL
9.8	Test of temperature-rise	ACTL
9.9	28-days test	ACTL
9.10	Tripping characteristic	ACTL
9.11	Mechanical and electrical endurance	ACTL
9.12	short circuit	ACTL
9.13	Resistance to mechanical shock and impact	CBTL
9.14	Resistance to heat	CBTL
9.15	Resistance to abnormal heat and to fire	CBTL
9.16	Resistance to rust	CBTL

Summary of compliance with National Differences:

Copy of marking plate:



Test item particulars	
Type of circuit-breaker ..... :	C64N
Number of poles ..... :	☐ 1-P ☐ 1-P+N ☐ 2-P ☐ 3-P ☐ 3-P+N ☒ 4-P ☐ Other .....
Protection against external influences ..... :	☐ enclosed ☒ unenclosed
Method of mounting ..... :	☐ surface ☒ flush ☒ panel board / distribution board
Method of connection ..... :	☐ not associated with the mechanical mounting ☒ associated with the mechanical mounting
Instantaneous tripping current ..... :	☐ B ☒ C ☐ D
Ambient air temperature (°C) ..... :	☒ 30°C ☐ 40°C ☐ Other _____°C
Energy limiting class ..... :	☐ Class 1 ☐ Class 2 ☐ Class 3
Rated short-circuit capacity (A) ..... :	☐ 1,5 kA ☐ 3 kA ☐ 4,5 kA ☒ 6 kA ☐ 10 kA ☐ 7,5 kA ☐ 20 kA ☐ 25 kA
Type of terminal ..... :	☐ screw [a) b)] ☒ pillar [a) b)] ☐ cage [a) b)] ☐ lug ☐ screw less [a)] ☐ flat quick connect [a)] ☐ plug-in ☐ screw-in [a)] copper conductors [b)] aluminium conductors***
Value of rated operational voltage ..... :	☐ 120 V ** ☐ 230 V ☐ 240 V ** ☐ 120/240 V ** ☐ 230/400 V ☒ 400 V ☐ 240/415 V ☐ 415 V
Value of rated current ..... :	1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A
Value of rated frequency ..... :	☒ 50 Hz ☒ 60 Hz
Rated impulse withstand voltage (Uimp)	☐ 2,5 kV** ☒ 4 kV ☐ declared ___kV
Material group and CTI declared by manufacturer	☐ Group I, (600 V ≤ CTI) ☐ Group II, (400 V ≤ CTI < 600 V) ☒ Group IIIa, (175 V ≤ CTI < 400 V)

Remark:
** delete for EN and *** only for EN

General remarks:

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Annex 1 of this test report covers the evaluation of the CENELEC common modifications.

This test report is valid only being read together with the test reports of 130700021SHA-001, -002,-003

Factory: ELMARK INDUSTRIES SC / 2 Dobrudzha blvd., Dobrich, Bulgaria

General product information:

C64N

Ue=400V~, 4P, C Type

I_n=1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A

Icn=Ics=6kA, Uimp=4kV, 50/60Hz

Number of tests for simplified test procedure, according to table C.3 and C.4

Report ref.No	No. of poles	In(A)	Type	Test sequence and number of samples								
				A	B	C1	C2	D0+D1	D0	E1	E2	E3 [b]
130700021 SHA-001	1P	63	C	x	x	x	x	x	-	x	-	-
	1P	50	C	-	-	-	-	-	x[a]	-	-	-
	1P	40	C	-	-	-	-	-	x[a]	-	-	-
	1P	32	C	-	-	-	-	-	x[a]	-	-	-
	1P	25	C	-	-	-	-	-	x[a]	-	-	-
	1P	20	C	-	-	-	-	-	x[a]	-	-	-
	1P	16	C	-	-	-	-	-	x[a]	-	-	-
	1P	10	C	-	-	-	-	-	x[a]	-	-	-
	1P	6	C	-	-	-	-	-	x[a]	-	-	-
	1P	4	C	-	-	-	-	-	x[a]	-	-	-
	1P	2	C	-	-	-	-	-	x[a]	-	-	-
	1P	1	C	-	-	-	-	-	x[a]	x	-	-
130700021 SHA-002	2P	63	C	-	-	-	x	-	-	x	-	-
	2P	1	C	-	-	-	-	-	-	x	-	-
130700021 SHA-003	-	-	-	-	-	-	-	-	-	-	-	-
130700021 SHA-004	4P	63	C	x	x	x	x	x	-	x	-	-
	4P	1	C	-	-	-	-	-	-	x	-	-

Note:
a): For this test sequence only test of clause 9.10.2 is required according to table C.4.
b):Test sequence in EN 60898-1, due to Icn1=Icn, the test sequence is omitted.

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	TESTS „A":1 SAMPLE:C63, 4 poles	**A_1**	
6 *)	**MARKING AND OTHER INFORMATION**		
**see Annex 1*	Circuit-breaker marked with:		
	a) Manufacturer's name or trade mark .....:	ELMARK	
	b)Type designation, catalogue number or other identification number .....:	C64N	P
	c) Rated voltage (V).....:	400~	P
	d) Rated current (A).....:	63	P
	e) Rated frequency (Hz) .....:		N/A
	f) Rated short circuit capacity (A) .....:	6000	P
	g) Wiring diagram		P
	h) Ambient air temperature, if different from 30°C		N/A
	i) Degree of protection, if different from IP20		N/A
	j) For D-type circuit-breakers: the maximum instantaneous tripping current, if higher than 20 In(see table 2)		N/A
	k) Rated impulse withstand voltage Uimp if it is 2,5 kV		N/A
	Symbol for instantaneous tripping current	C	P
	Symbol for nature of supply	~	P
	Marking for rated current and for instantaneous tripping shall be readily visible when CB is installed		P
	Other marking shall be easily discernible		P
	The suitability for isolation, which is provided by all circuit-breakers of this standard, may be indicated by the symbol on the device		P
	Energy limiting class		N/A
	I^2t characteristic (documentation)		N/A
	Symbols on supply and load terminal	"1,3,5,7", "2,4,6,8"	P
	Terminal for neutral conductor N		N/A
	Earthing terminal if any (IEC 60417-5019)		N/A
	On - off position shall be clearly indicated - 0 I -	**ON - OFF**	P
	For push-button CB the off push-button shall either be red or be marked with the symbol '0'		N/A
	Red not used for other push-button		N/A
	This symbol shall be easily discernible		N/A
	For CB with multiple current ratings, the maximum value is marked, the adjusted value indicated without ambiguity		N/A

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Marking shall be indelible and easily legible (not on removable parts), 15 s with water, 15 s with hexane (see cl. 8.3)		P
8.	**REQUIREMENTS FOR CONSTRUCTION AND OPERATION**		
8.1.1	**General**		
8.1.2	**Mechanism**		
	The moving contact shall be mechanically coupled so that all poles make and break together, whether operated manually or automatically, even if an overload occurs on one pole only		P
	The switched neutral shall close before and open after the protected pole (s)		N/A
	Neutral pole having adequate making and breaking capacity and CB with independent manual operation: all poles operate together including neutral pole		N/A
	CB shall have a trip free mechanism		P
	It shall be possible to switch the CB on and off by hand		P
	No intermediate position of the contacts		P
	Position of contacts shall be indicated		P
	Indication visible from the outside		P
	If the indication is on the actuating means, it shall, when released, automatically take up or stay in the position corresponding to that of the moving contacts; operating means shall have two different rest positions, except that, for automatic operation, a third distinct rest position may be provided		P
	If a separate mechanical indicator is used to indicate the position of the main contacts, colour red shall be used for the on position and green for the off position.		P
	The action of the mechanism shall not be influenced by the position of enclosures		P
	If the cover is used as a guiding means for push-button, it shall not be possible to remove this button from the outside		N/A
	Operating means securely fixed, not possible to remove them without a tool		P
	For the up-down operating means the contacts shall be closed by the up movement.		P
8.1.3	**Clearances and creepage distances**		
8.1.3	**Clearances [mm] see table 4**		
	1.between live parts (of the main circuits) which are separated when the CB is in off position .....:	5,4mm	P

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	2.between live parts of different polarity.....:	>12,0mm	P
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		N/A
	4. between live parts and		
	- accessible surfaces of operating means.....:	9,0mm	P
	- screws or other means for fixing covers .....:		N/A
	- surface on which the base is mounted.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal covers or boxes.....:		N/A
	- other accessible metal parts .....:	>8,0mm	P
	- metal frames supporting the base (flush-type) .:	>8,0mm	P
	5.between metal parts of mechanism and:		
	- accessible metal parts.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal frames supporting the base (flush type)..:		N/A
8.1.3	**Creepage distances [mm] (see table 4)**		
	Material group	☒ IIIa ☐ II ☐ I	P
	1.between live parts (of the main circuits) which are separated when the CB is in off position .....:	>8,0mm	P
	2.between live parts of different polarity.....:	>12,0mm	P
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		N/A
	4. between live parts and		
	- accessible surfaces of operating means.....:	>10,0mm	P
	- screws or other means for fixing covers .....:		N/A
	- surface on which the base is mounted.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal covers or boxes.....:		N/A
	- other accessible metal parts .....:	>8,0mm	P
	- metal frames supporting the base (flush-type) .:	>8,0mm	P
	5.between metal parts of mechanism and:		
	- accessible metal parts.....:		N/A
	- screws or other means for fixing the circuit breaker.....:		N/A
	- metal frames supporting the base (flush type)..:		N/A
8.1.4	**Screws, current-carrying parts and connections**		
8.1.4.1	Connections, withstand mechanical stresses occurring in normal use		P

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Screws for mounting of the CB not of the thread-cutting type		N/A
	Test according to cl. 9.4:		
	- 10 times (screw Ø / torque Nm)	Ø___mm___Nm (see table 10) Ø___mm___Nm	N/A
	- 5 times (screw Ø / torque Nm)	Ø 4,8 mm 2 Nm (see table 10) Ø___mm___Nm	P
	Plug in connections tested by plugging in and pulling out five times		N/A
	After test connections have not become loose nor electrical function impaired		P
8.1.4.2	Screws with a thread of insulating material ensured correct introduction		N/A
8.1.4.3	Electrical connection: contact pressure not transmitted through insulating material, unless there is sufficient resilience in the metallic parts		
	- copper		N/A
	- alloy 58% copper for worked cold parts		P
	- alloy 50% copper for other parts		N/A
	- other metal		N/A
8.1.5	**Terminals for external conductors**		
8.1.5.1	Terminals ensure correct connection of conductors (Test acc. to cl. 9.5 or annex J or K)	Rigid or stranded conductors	P
9.5	Torque Ø 4,8 mm 2 Nm Ø___mm___Nm Ø___mm___Nm max. sect. 25 mm²		P
9.5.1	Pull test: min sect. 1.0 mm², Pull 50 N max sect. 25 mm², Pull 100 N Pull 50/100 N for 1 min During the test conductor does not move noticeably		P
9.5.2	min sect. 10 mm² Torque (2/3)=1,33 Nm max sect. 25 mm² The conductor shows no damage		P
9.5.3	Nominal cross-section from 1.0 to 25 mm² No of wires 7 Ø of wires 0,67 mm Ø of wires 2,14 mm Torque (2/3) = 1,33Nm After the test no wire escaped outside		P

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.1.5.2	Terminals allow the connection of conductors of the following cross-sectional areas: (table 5)		P
	Rated current (A) / Range of nominal cross sections to be clamped (mm²): **≤ 13: 1 to 2,5** **> 13 ≤ 16: 1 to 4** **> 16 ≤ 25: 1,5 to 6** **> 25 ≤ 32: 2,5 to 10** **> 32 ≤ 50: 4 to 16** **> 50 ≤ 80: 10 to 25** > 80 ≤ 100: 16 to 35 > 100 ≤ 125: 25 to 50		P
	It is required that, for current ratings up to and including 50 A terminals are designed to clamp solid conductors as well as rigid stranded conductors; the use of flexible conductors is permitted		P
	Nevertheless, it is permitted that terminals for conductors having cross-sections from 1 mm^2 up to 6 mm^2 are designed to clamp solid conductors only.	____ to _____ mm²	N/A
8.1.5.3	Means for clamping the conductors in the terminals not serve to fix any other component (See test sub-clause 9.5)		P
8.1.5.4	Terminals for $I_N \leq 32$ A allow the connection of conductors without special preparation		P
8.1.5.5	Terminals shall have adequate mechanical strength; ISO thread or equivalent (See tests of sub-clause 9.4 and 9.5.1)		P
8.1.5.6	Clamping of conductor without damage to the conductor (See test of sub-clause 9.5.2)		P
8.1.5.7	Clamping of conductor between metal surfaces (See tests of sub-clause 9.4 and 9.5.1)		P
8.1.5.8	Conductor shall not slip-out when the clamping screw or nuts are tightened (See test of sub-clause 9.5.3)		P
8.1.5.9	Terminals shall be properly fixed. No work loose when the clamping screws or nuts are tightened or loosened (See test of sub-clause 9.4)		P
8.1.5.10	Clamping screws or nuts of terminals for protective conductors adequately secured against accidental loosening		N/A
8.1.5.12	Screws and nuts of terminals for external conductors shall be in engagement with a metal thread, and the screws shall not be of tapping screw type		P

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.1.6	**Non interchangeability**		
	For circuit-breakers intended to be mounted on bases forming a unit therewith (plug-in or screw-in type) it shall not be possible, without the aid of a tool, to replace a circuit-breaker when mounted as for normal use by another of the same make having a higher rated current, compliance is checked by inspection		N/A
8.1.7	**Plug-in type circuit-breakers, the holding in position of which does not depend solely on their plug-in connection(s), shall be reliable and have adequate stability**		
8.1.7.1	Plug-in type circuit-breakers, the holding in position of which does not depend solely on their plug-in connection(s) Compliance of the mechanical mounting is checked by the relevant test 9.13		N/A
8.1.7.2	Plug-in type circuit-breakers, the holding in position of which does depend solely on their plug-in connection(s) Compliance of the mechanical mounting is checked by the relevant test 9.13		N/A
8.2	**Protection against electric shock**		
	Live parts not accessible in normal use		P
	For CB, other than plug-in type, external parts, other than screws and other means for fixing covers, which are accessible shall be of insulating material		N/A
	Unless the live parts are within an internal enclosure of insulating material: Lining - reliable fixed, - adequate thickness and - mechanical strength		P
	Inlet openings for cables shall be in insulating material or be provided with bushings or similar devices in insulating material Such device - shall be reliable fixed - shall have adequate mechanical strength		N/A
	For plug-in CB, external parts, other than screws and other means for fixing covers, which are accessible shall be in insulating material		N/A
	Metallic operating means insulated from live parts		N/A
	Metal parts of the mechanism not accessible and insulated from accessible metal parts, metal frames (for flush-type), screws or other means for fixing the base		P
	Replacement of plug-in CB possible without touching live parts		N/A
	Lacquer or enamel not considered		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.6	**Test of protection against electric shock**		
	Use of test finger so designed that each jointed can be turned through an angle of 90° with respect to the finger	Flush-type mounted as for Normal use	P
	Circuit-breaker with enclosures of thermoplastic material are additional tested at 35 °C for 1 min with a force of 75 N		P
7.10	**Resistance to heat**		
	CB sufficiently resistant to heat		P
9.14	**Test of resistance to heat**		
9.14.1	Test:		
	- without removable covers ..... 1 h (100 ± 2) °C	100	P
	- removable covers..... 1 h (70 ± 2) °C		N/A
	After the test no access to live parts, marking still legible		P
9.14.2	Ball pressure test for external parts of insulating material (parts retaining current-carrying parts and parts of the protective circuit in position) T = 125°C Ø of impression ≤ 2 mm	Impression: 1,5mm	P
9.14.3	Ball pressure test for external parts of insulating material (parts not retaining current-carrying parts and parts of the protective circuit in position T = (70 ± 2)°C or T = ___ °C = (40 ± 2)°C + max. temperature rise of sub-clause 8.8 Ø of impression ≤ 2 mm	Impression: 1,0 mm	P
8.11	Resistance to abnormal heat and to fire		
	External parts of insulating material shall not ignite or spread fire under fault or overload conditions		P
9.15	**Resistance to abnormal heat and to fire**		
	Glow wire test: No visible flame, no sustained glowing or flames and glowing extinguish within 30 s		
	external parts retaining current-carrying parts and parts of the protective circuit in position..... (960 ± 15)°C	2,3s	P
	all other external parts ..... (650 ± 10)°C	No visible flame	P
8.12	Resistance to rusting		
	Ferrous parts adequately protected against rusting		
9.16	Test of resistance to rusting:		
	- 10 min immersed in a cold chemical degreaser such as methyl-chloroform or refined petrol		
	- 10 min immersed in a 10% solution of chloride in water at 20°C		

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Clause	Requirement + Test	Result - Remark	Verdict
	- 10 min at 95% humidity at 20°C		
	- 10 min at 100°C		
	No sign of rust		P

	TESTS „B“ 3 samples: C63, 4 pole	B_1 B_2 B_3	
8.3	**Dielectric properties and isolating capability**		
	CB shall have adequate dielectric properties and shall ensure isolation:		P
8.3.1	Dielectric strength at power frequency		
	Compliance is checked by the tests 9.7.1, 9.7.2 and 9.7.3 on circuit-breaker in new condition		P
8.3.2	Isolating capability		
	Circuit-breakers shall be suitable for isolation. Compliance is checked by the verification of compliance with the minimum clearances and creepage distances of item 1 of table 4 and by tests of 9.7.6.1 and 9.7.6.3.		P
8.3.3	Dielectric strength at rated impulse withstand voltage (U_{imp})		
	Circuit-breakers shall adequately withstand impulse voltages. Compliance is checked by the tests of 9.7.6.2.		P
9.7	**Test of dielectric properties and isolating capability**		
9.7.1	Resistance to humidity		P
9.7.1.1	Preparation of the circuit-breaker for test		P
	Inlet openings, if any, are left open; if knock-outs are provided, one of them is opened.		N/A
9.7.1.2	Test conditions		
	The humidity treatment is carried out in humidity cabinet 91% to 95% and the temperature of the air between 20 °C and 30 °C	Rf =93 % T =25°C	P
9.7.1.3	Test procedure:		
	The sample is kept in the cabinet for 48 h.		P
9.7.1.4	Condition of the circuit-breaker after the test		
	After this treat, the sample show no damage within the meaning of this standard and shall withstand the tests of 9.7.2 and 9.7.3		P
9.7.2	Insulation resistance of the main circuit		
9.7.2	After an interval between 30 min and 60 min flowing this treatment, the insulation resistance is measured 5 s after application of a d.c. voltage of approximately 500 V, consecutively as follows:	[MΩ] [MΩ] [MΩ]	-
	a) In off-position, between the terminals which are electrically connected together when the circuit-breaker is in the closed position ≥ 2 MΩ	>500 MΩ >500 MΩ >500 MΩ	P

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Clause	Requirement + Test	Result - Remark	Verdict
	b) in off-position, between each pole in turn and the others connected together ≥ 2 MΩ	>500 MΩ >500 MΩ >500 MΩ	P
	c) in on-position, between all poles connected together and the frame ≥ 5 MΩ	>500 MΩ >500 MΩ >500 MΩ	P
	d) between metal parts of mechanism and the frame ≥ 5 MΩ		N/A
	e) between the frame and metal foil in contact with the inner surface of the internal enclosure or lining of insulating material ≥ 5 MΩ		N/A
9.7.3	Dielectric strength of the main circuit		
	After the circuit-breakers have passed the tests of 9.7.2 the test voltage specified in 9.7.5 is applied for 1 min between the parts indicated in 9.7.2		P
	a) 2000 V		P
	b) 2000 V		P
	c) 2000 V		P
	d) 2000 V		N/A
	e) 2500 V		N/A
9.7.4	Dielectric strength of the auxiliary and control circuits		
	For these tests, the main circuit shall be connected to the frame. The test voltage specified in 9.7.5 shall be applied for 1 min as follows:		N/A
	1) Between all the auxiliary or control circuits and the frame U = ____ V	U = ____ V	N/A
	2) Between each part of the auxiliary or control circuits which may be isolated from the other parts of the auxiliary or control circuits and these other parts connected together U = [1000 V if Ui ≤ 60 V or 2Ui + 1000 V if Ui > 60 V]	U = ____ V	N/A
9.7.6	Verification of the impulse withstand voltage (across clearances and across solid insulation) and leakage current across open contacts		
9.7.6.1	Verification of the impulse withstand voltage across open contacts (suitability for isolation)		
	The 1,2/50µs impulse voltage shall be applied three times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	4kV	
	- sea level of the laboratory:	Sea level	
	- test Uimp on open main contacts (equipment suitable for isolating) (see table 13) :	U_{test} =6,2kV	
	- no unintentional disruptive discharge during the test's		P
9.7.6.2	Verification of impulse withstand voltage for the parts not test in 9.7.6.1		
	The 1,2/50µs impulse voltage shall be applied three times for each polarity at intervals of 1s minimum		

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Clause	Requirement + Test	Result - Remark			Verdict
	- rated impulse withstand voltage (kV) :	4kV			
	- sea level of the laboratory:	Sea level			
	- test Uimp main circuits (see table 14) :	U_{test} =4,9kV			
	Application of test voltage				
	i) Between all the phase pole(s) connected together and to the neutral pole (or path) of the circuit-breaker				N/A
	ii) Between all the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminals intended for the protective conductor(s)				P
	- no unintentional disruptive discharge during the test's				P
9.7.6.3	Verification of leakage currents across open contacts (suitability for isolation)				
	For circuit-breakers suitable for isolation, the leakage current shall be measured. Each pole having been submitted to the test of 9.12.11.2, or 9.12.11.3, or 9.12.11.4.2 or 9.12.11.4.3 is supplied at a test voltage of 1,1 times its rated operational voltage, the circuit-breaker being in the open position				
	The leakage current flowing across the open contacts is measured and shall not exceed 2 mA	$\times 10^{-3}$ [mA] 6,52(max)	$\times 10^{-3}$ [mA] 6,34(max)	$\times 10^{-3}$ [mA] 6,20(max)	P
8.4	**Temperature rise**				
	Temperature rise does not exceed the limiting values stated in table V:	sect. 16 mm²			
9.8.2	Test current: I_N= (reach the steady-state value) Four-pole CB's: ☐ 1) Three poles loaded 2) One pole and neutral pole loaded ☒ 1) Four-poles loaded	I_N = 63A			
	Ambient air temperature..... :	Tamb= 22,6°C			
	Parts ..... Temperature rise [K]	[K]	[K]	[K]	
	L1	55	53	54	P
	L2	57	56	58	
	L3	58	57	58	
	L4	57	56	55	
	L3	-	-	-	
	N	-	-	-	
	Terminals for external connections 60				P
	External parts liable to be touched during manual operation of the circuit-breaker, including operating means of insulating material and metallic means for coupling of insulating operating means of several poles 40	21	22	23	P

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Clause	Requirement + Test	Result - Remark			Verdict
	External metallic parts of operating means 25	-	-	-	N/A
	Other external parts, including that face of the circuit-breaker is in direct contact with the mounting surface 60	54	53	56	P
9.8.5	**Measurement of power losses**	**B_1**	**B_2**	**B_3**	
	Power loss do not exceed the values stated in table 15				P
	Test current: I_N = 63A (reach the steady state value)	63A			P
	Loaded one pole after the other				P
	Max. power loss : 13 W	W	W	W	
	L1	5,10	4,95	5,04	P
	L2	5,23	5,31	5,35	
	L3	5,30	5,24	5,32	
	L4	5,26	5,17	5,11	
	L3	-	-	-	
	N	-	-	-	
8.5	Uninterrupted duty				
	Circuit-breakers operate reliable even after long service				P
9.9	**28 day test**				
	28 cycles- 21 h with current - 3 h without current cross sectional area. 16 mm²	I_N =63 A			
	During the test no tripping during the last period, temperature rise shall be measured				P
	Ambient air temperature ..... :	22,1° C			
	Parts ..... Temperature rise [K]	[K]	[K]	[K]	
	Terminals for external connections 75K	68	65	66	P
	The temperature rise does not exceed the value measured during the temperature rise test (subclause 8.8) by more than 15 K				P
	Test current 1,45 I_N = 91,4A				P
	- Tripping within	[s]	[s]	[s]	
	- 1h (≤ 63 A)	127	94	119	P
	- 2h (> 63 A)				N/A

	TESTS „C“ 3+1 samples: C63, 4 poles				
8.7	**Test C_1: ..... Mechanical and electrical endurance**	**C_{1-1}**	**C_{1-2}**	**C_{1-3}**	
	Circuit-breaker shall be capable to perform an adequate number of cycles with rated current				
9.11.1	General test conditions				

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Clause	Requirement + Test	Result - Remark	Verdict
	Test: Test Voltage 400 V (rated voltage) Test Current 63 A (rated current) Power factor (0,85-0,9) Par. resistor _____ Ohm Cross sect. area 16 mm²	402V 63,1A 0,86	P
9.11.2	**Test procedure**		
	The circuit-breaker is submitted to 4000 operating cycles with rated current.	4000 cycles	
	- $I_N \leq 32$ A: 2 s on - 13 s off		N/A
	- $I_N > 32$ A: 2 s on - 28 s off	I_n= 63A	P
	During the test the circuit-breaker shall be operated as in normal use.		P
9.11.3	**Condition of the circuit-breaker after the test**		
	Following the test 9.11.2 the sample shall not show:		
	- undue wear		P
	- discrepancy between the position of the moving contacts and corresponding position of the Indicating device		P
	- damage to the enclosure permitting access to live parts by test finger (see 9.6		P
	- loosening of electrical or mechanical connections		P
	- seepage of sealing compound		N/A
	Moreover test current .....2,55 I_N= 161A	161A	
	Opening time not less 1 s or more than	[s] [s] [s]	
	- 60 s (≤ 32 A)	- - -	N/A
	- 120 s (> 32 A)	58 57 56	P
	Dielectric strength reduced to 1500 V *)see Annex 1		P
9.12.11.2	**Test at reduced short-circuit currents**		
9.12.11.2.1	Test on all circuit-breakers		
9.12.11.2.1	Test at reduced short-circuit currents: Fig. 3	Figure 3	
	Test current:	Obtained	
	- 500 A or 10 In	I_{test} = 246V	P
	Test voltage 1,05 Un	U_{test} =632A	P
	Power factor 0,93-0,98	0,96	P
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 35 mm	P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	I_{Peak} (A) max. value	909			P
	Sequence: 6 x "0" and 3 x "CO"	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s	3,45	3,25	3,82	P
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12	**Verification of the circuit-breaker after short-circuit tests**				
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position	C_{1-1} [mA] $\times 10^{-3}$	C_{1-2} [mA] $\times 10^{-3}$	C_{1-3} [mA] $\times 10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,38	6,62	6,70	P
	L2	6,52	6,54	6,80	P
	L3	6,60	6,49	6,94	P
	L4	6,50	6,60	6,68	P
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A

9.12.11.2.2	**Test C_2 : Short-circuit test on circuit-breakers rated 230 V, or 240 V or 230/400 V for verifying for use in IT systems**		
	Test current:	Obtained	
	- 500 A or 1,2 times the upper limit of the standard	I_{test}=762A	P
	Test voltage 1,05 Un	U_{test}= 436V	P
	Power factor 0,93-0,98	0,97	P
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 35 mm	P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm	N/A
	I_{Peak} (kA) max. value	1,08	P
	Sequence: "O" + "CO" on each protected pole	[kA^2s]	

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Clause	Requirement + Test	Result - Remark	Verdict
	Shifted point 30 ° on the other protected pole	C_{2-1}	
	Max. $I^2t \leq$ _____ kA^2s L1 L2 L3 L4	4,74 5,34 4,82 4,01	P
	- No permanent arcing		P
	- No flash-over between poles or between poles and frame		P
	- No blowing of the fuses F and F'		P
	- Polyethylene foil shows no holes		P
	After the test:		
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**		
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times U_n.= 440V. The circuit –breaker is in the open position	C_{2-1} [mA] $\times 10^{-3}$	
	The leakage current shall not exceed 2 mA L1	6,18	P
	L2	6,33	P
	L3	6,37	P
	L4(N)	6,29	P
	Electric strength test:		
	Test voltage 1500 V (see 8.7.2)		
	a)		P
	b)		P
	c)		P
	d)		N/A
	e) 2000 V		N/A

	TESTS „D" 3+3 SAMPLES: C63, 4 pole				
8.6	**Automatic operation**				
8.6.1	Standard time-current zone				
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.				
9.10	**Tests: D_O**	**D_{1-1}**	**D_{1-2}**	**D_{1-3}**	
	I_N (A)	63A			
	Sect. (mm²)	16mm²			
	Instantaneous tripping current	☐ B	☒ C	☐ D	
9.10.1	Test of time-current characteristic				
9.10.1.1	Test current 1,13 I_N (A) starting from cold for:	71,2A			
	- 1 h ($I_N \leq 63$ A)	>1h	>1h	>1h	P

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Clause	Requirement + Test	Result - Remark			Verdict
	- 2 h (I_N > 63 A)				N/A
	No tripping				P
	Then steadily increased within 5 s to 1,45 I_N (A)	91,4A			
	- Tripping within	[s]	[s]	[s]	
	- 1h (≤ 63 A)	150	198	119	P
	- 2h (> 63 A)				N/A
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	161A			
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s				N/A
	- 120 s	61	57	56	P
9.10.2	Test of instantaneous tripping and of correct opening of the contacts				
9.10.2.1	General test conditions				
	For the lower values of the test current the test is made once, at any convenient voltage.				
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.				
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min				
	The tripping time of the O operation is measured				
	After each operation the indicating means shall show the open position of the contacts				P
9.10.2.2 *)	☐ For circuit-breakers of the B – Type				
*see Annex 1	Test current 3I_N (A), starting from cold				
	Opening time:	[s]	[s]	[s]	
	- 0,1s ≤ t *[≤ 45s (≤ 32A) *)acc. EN60898]*				N/A
	- 0,1s ≤ t *[≤ 90s (> 32A) *)acc. EN60898]*				N/A
	Test current 5 I_N (A), starting from cold				
	Tripping less than 0,1 s				N/A
9.10.2.3 *)	☒ For circuit-breakers of the C – Type				
*see Annex 1	Test current 5I_N (A), starting from cold	315			
	Opening time:	[s]	[s]	[s]	
	- 0,1s ≤ t *[≤ 15s (≤ 32A) *)acc. EN60898]*				N/A
	- 0,1s ≤ t *[≤ 30s (> 32A) *)acc. EN60898]*	8,73	8,09	7,84	P
	Test current 10 I_N (A), starting from cold	640			
	Tripping less than 0,1 s	8,24ms	7,66ms	7,82ms	P
9.10.2.4 *)	☐ For circuit-breakers of the D – Type				
*see Annex 1	Test current 10I_N (A), starting from cold				
	Opening time:	[s]	[s]	[s]	
	- 0,1s ≤ t *[≤ 4s (≤ 32A) *)acc. EN60898]*				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	- 0,1s ≤ t *[≤ 8s (> 32A) *)acc. EN60898]*				N/A
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold				
	Tripping less than 0,1 s				N/A
9.10.1.2	Test current 2,55 IN (A) starting from cold for:	161			
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s				N/A
	- 120 s	59	55	57	P
9.10.3	Test of effect of single pole loading on the tripping characteristic of multipole circuit-breakers:				
	Test current 1,1 It (A), (two pole) starting from cold	———			
	Tripping within	[min]	[min]	[min]	
	- 1h				N/A
	- 2h				N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold				
	Tripping within	[min]	[min]	[min]	
	- 1h	4,3	4,1	4,1	P
	- 2h				N/A
9.10.4	Test of effect of ambient temperature on the tripping characteristics				
	a) Ambient temperature of (-5 ± 2)°C below the ambient air reference temperature	T = -5°C			
	Test current 1,13 I_N (A)	71,2A			
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	120A			
	Tripping within	[s]	[s]	[s]	
	- 1h	127	191	117	P
	- 2h				N/A
	b) Ambient temperature of (40 ± 2)°C	40 °C			
	Test current I_N (A)	63A			
	No tripping within				
	- 1h	>1h	>1h	>1h	P
	- 2h				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS: D_1	**D_{1-1} D_{1-2} D_{1-3}**	
8.9	**Resistance to mechanical shock and impact**		
	CB shall have adequate mechanical behaviour so as to withstand the stresses imposed during installation and use		P
9.13.1	**Mechanical shock**		
	- 50 falls on two sides of vertical board C		
	- Vertical board turned 90°		
	- 50 falls on two sides of vertical board C		
	During the test the circuit-breakers shall not open		P
9.13.2	**Mechanical impact**		
9.13.2.1	All types:		
	- Impact test: 10 blows-height 10 cm, no damage		P
9.13.2.2	Screw-in types:		
	- Torque 2,5 Nm for 1 min, no damage		N/A
9.13.2.3	CB intended to be mounted on a rail		
	- downward vertical 50 N for 1 min		P
	- upward vertical 50 N for 1 min, no damage		P
9.13.2.4	Plug-in types		
	The circuit-breaker are mounted in there normal position, complete with plug-in base but without cables and any cover plate		
	A force of 20 N applied for 1min to the circuit-breaker (see fig 17).		
	During this test the circuit-breaker part shall not become loose from the base and shall not show damage impairing further use.		P
9.12.11.3	**Test at 1500 A:**		
	Prospective current of 1500 A - power factor 0,93 to 0,98		
	Prospective current obtained (A)	$1,52x10^3$A	
	Power factor	0,95	
	Test voltage 1,05 Un	U_{test} = 426V	
	Test circuit: figure	Figure 6	
	T (min)	3 min	
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 35 mm	
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm	
	Sequence	6-O, 3-CO	

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Clause	Requirement + Test		Result - Remark		Verdict
	I_{Peak} (kA) max. value		1,65		
	$I^2t \leq$ _____ kA^2s		[kA^2s]	[kA^2s]	[kA^2s]
	Max. $I^2t \leq$ _____kA^2s	L1	8,19	8,44	8,17
		L2	8,32	9,64	8,26
		L3	7,60	6,87	6,82
		L4	–	–	–
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position		D_{1-1} [mA] $x10^{-3}$	D_{1-2} [mA] $x10^{-3}$	D_{1-3} [mA] $x10^{-3}$
	The leakage current shall not exceed 2 mA	L1	6,62	6,17	6,40 P
		L2	6,48	6,46	6,28 P
		L3	6,37	6,52	6,29 P
		L4	6,29	6,39	6,17 P
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non tripping current (1,13 I_N)		60,6A		
	- Passed for 1h		>1h	>1h	>1h P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s		101A		
			D_{1-1} [s]	D_{1-2} [s]	D_{1-3} [s]
	Tripping within ☒ 1 hour / ☐ 2 hour		121	40	39 P
9.12.11.3	**Test at 1500 A:**		D_{1-4}	D_{1-5}	D_{1-6}
	Prospective current of 1500 A - power factor 0,93 to 0,98				
	Prospective current obtained (A)		1,52x10^3A		

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Clause	Requirement + Test		Result - Remark		Verdict
	Power factor		0,95		
	Test voltage 1,05 Un		U_{test} = 426V		
	Test circuit: figure		Figure 6		
	T (min)		3 min		
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm		"a" = 35 mm		
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm		dimension of enclosure: _____x_____x_____mm		
	Sequence		6-O, 3-CO		
	I_{Peak} (kA) max. value		1,79		
	$I^2t \leq$ _____ kA^2s		[kA^2s]	[kA^2s]	[kA^2s]
	Max. $I^2t \leq$ _____kA^2s	L1	-	8,98	4,30	P
		L2	7,44	-	8,21	
		L3	8,77	10,5	-	
		L4	3,14	3,23	5,32	
	- No permanent arcing					P
	- No flash-over between poles or between poles and frame					P
	- No blowing of the fuses F and F'					P
	- Polyethylene foil shows no holes					P
	After the test:					
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.					
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position		D_{1-4} [mA] $x10^{-3}$	D_{1-5} [mA] $x10^{-3}$	D_{1-6} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA	L1	6,41	6,30	6,48	P
		L2	6,38	6,26	6,54	P
		L3	6,54	6,39	6,68	P
		L4	6,62	6,41	6,57	P
	Electric strength test:					
	Test voltage 1500 V (see 8.7.2)					
	a)					P
	b)					P
	c)					P
	d)					N/A
	e) 2000 V					N/A
	Test current 0.85x non tripping current (1,13 I_N)		60,6A			

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Clause	Requirement + Test	Result - Remark			Verdict
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			
		D_{1-4} [s]	D_{1-5} [s]	D_{1-6} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	181	78	48	P

	TESTS „E" 3 SAMPLES **) SEE ANNEX 1* **: C63, 4 poles**				
8.12.11.4.2	**Test: E_1 :Test at service short-circuit capacity**	E_{1-1}	E_{1-2}	E_{1-3}	
	Service short-circuit capacity .....:	6000A			
	Test circuit: figure .....:	Figure 5			
	Prospective current .....:	6000A			
	Prospective current obtained .....:	$6,06x10^3$A			
	Power factor .....:	0,65~0,70			
	Power factor obtained .....:	0,68			
	Sequence .....:	O - CO - CO			
	T (min) .....:	3min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value .....:	4,20			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4	23,5 33,3 56,5 -	31,8 52,0 33,5 -	35,7 15,8 26,5 -	P
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position	E_{1-1} [mA] $x10^{-3}$	E_{1-2} [mA] $x10^{-3}$	E_{1-3} [mA] $x10^{-3}$	

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Clause	Requirement + Test	Result - Remark			Verdict
	The leakage current shall not exceed 2 mA L1	6,74	6,93	6,84	P
	L2	6,82	6,86	6,83	P
	L3	6,84	7,01	6,74	P
	L4	6,79	6,84	6,82	P
	Electric strength test:				
	Test voltage 1500 V (see 8.7.2)				
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non tripping current (1,13 I_N)	60,6A			
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			
		E_{1-1} [s]	E_{1-2} [s]	E_{1-3} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour	77	189	168	P

	TESTS „E" 3 SAMPLES *) SEE ANNEX 1 : C1,4 poles				
8.12.11.4.2	**Test: E_1 :Test at service short-circuit capacity**	E_{1-4}	E_{1-5}	E_{1-6}	
	Service short-circuit capacity .....:	6000A			
	Test circuit: figure .....:	Figure 5			
	Prospective current .....:	6000A			
	Prospective current obtained .....:	6,06x10^{3}A			
	Power factor .....:	0,65~0,70			
	Power factor obtained .....:	0,68			
	Sequence .....:	O - CO - CO			
	T (min) .....:	3min			
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 45mm			P
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (kA) max. value .....:	0,430			
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	

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Clause	Requirement + Test		Result - Remark		Verdict
	Max. $I^2t \leq$ _____kA^2s	L1	0,307	0,779	0,596	P
		L2	0,460	0,347	0,199	
		L3	0,352	0,466	0,334	
		L4	-	-	-	
	- No permanent arcing					P
	- No flash-over between poles or between poles and frame					P
	- No blowing of the fuses F and F'					P
	- Polyethylene foil shows no holes					P
	After the test:					
9.12.12.1	**The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.**					
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= 440V. The circuit –breaker is in the open position		E_{1-4} [mA] $x10^{-3}$	E_{1-5} [mA] $x10^{-3}$	E_{1-6} [mA] $x10^{-3}$	
	The leakage current shall not exceed 2 mA	L1	6,44	6,13	6,90	P
		L2	6,38	6,18	7,00	P
		L3	6,52	6,22	6,81	P
		L4	6,69	6,75	6,76	P
	Electric strength test:					
	Test voltage 1500 V (see 8.7.2)					
	a)					P
	b)					P
	c)					P
	d)					N/A
	e) 2000 V					N/A
	Test current 0.85x non tripping current (1,13 I_N)		0,97A			
	- Passed for 1h		>1h	>1h	>1h	P
	- Passed for 2h					N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s		1,60A			
			E_{1-4} [s]	E_{1-5} [s]	E_{1-6} [s]	
	Tripping within ☒ 1 hour / ☐ 2 hour		57	75	46	P

ANNEX C (NORMATIVE)			
Test sequence and number of samples to be submitted for certification purposes Table C.1 - Test sequences			
Test sequence		Clause or subclause	Test (or inspection)
A		6 8.1.1 8.1.2 9.3 8.1.3 8.1.6 9.4 9.5 9.6 9.14 8.1.3 9.15 9.16	Marking General Mechanism Indelibility of marking Clearance and creepage distances (external parts only) Non-interchangeability Reliability of screws, current-carrying parts and connections Reliability of terminals for external conductors Protection against electric shock Resistance to heat Clearances and creepage distances (internal parts) Resistance to abnormal heat and to fire Resistance to rusting
B		9.7 9.8 9.9	Dielectric properties Temperature-rise 28-day test
C	C_1	9.11 9.12.11.2.1 9.12.12	Mechanical and electrical endurance Performance at reduced short-circuit currents Verification of the circuit-breaker after short-circuit tests
	C_2	9.12.11.2.2 9.12.12	Short-circuit test for verifying the suitability of circuit-breakers for use in IT systems Verification of the circuit-breaker after short-circuit tests
D	D_0	9.10	Tripping characteristic
	D_1	9.13 9.12.11.3 9.12.12	Resistance to mechanical shock and impact Short-circuit performance at 1 500 A Verification of circuit-breaker after short-circuit tests
E	E_1	9.12.11.4.2 and 9.12.12	Service short-circuit capacity (I_{cs}) Verification of circuit-breaker after short-circuit tests
	E_2	9.12.11.4.3 and 9.12.12	Performance at rated short-circuit capacity (I_{cn}) Verification of circuit-breaker after short-circuit tests
NOTE With the agreement of the manufacturer the same samples may be used for more than one test sequence.			

Table C.2 - Number of samples for full test procedure				
Test sequence		Number of samples	Minimum number of samples which shall pass the test [a) b)]	Maximum number of samples for repeated tests [c)]
A		1	1	--
B		3	2	3
C	C_1	3	2 [e)]	3
	C_2 [f)]	3	2 [e)]	3
D		3	2 [e)]	3
E_1		3 + 4 [d)]	2 [e)] + 2 [d), e)]	3 + 4 [d)]
E_2		3 + 4 [d)]	2 [e)] + 2 [d), e)]	3 + 4 [d)]

a) In total, a maximum of two test sequences may be repeated.

b) It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

c) In the case of repeated tests, all results shall be acceptable.

d) Supplementary samples in the case of single-pole circuit-breakers rated 230/400 V or 240/415 V (see table 1).

e) All samples shall meet the test requirements of 9.12.10, 9.12.11.2, 9.12.11.3 and 9.12.11.4, as appropriate.

f) For this sequence read "number of protected poles" instead of "number of samples". In total a maximum of three test sequences may be repeated.

Table C.3 - Number of samples for simplified test procedure

Test sequence		Number of samples depending on number of poles [a]			
		One pole [b]	Two poles [c]	Three poles [d]	Four poles [e]
A		1 max. rated I_N	1 [g),i)] max. rated I_N	1 [i)] max. rated I_N	1 [i)] max. rated I_N
B		3 max. rated I_N	3 [g)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
C	C_1	3 max. rated I_N	3 [i)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
C	C_2	3 max. rated I_N	2 max. rated I_N for 2 protected poles, or 3 max. rated I_N for one protected pole	1 max. rated I_N	1 max. rated I_N
$D_0 + D_1$		3 max. rated I_N	3 [h)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
D_0		1 of all other rated I_N			
E_1		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N
E_2		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N

a) If a test is to be repeated according to the acceptance criteria of C.2, a new set of samples is used for the relevant test sequence. In repeated tests all results shall be satisfactory.
b) If only multipole circuit-breakers are submitted, this column applies to the set of samples having the smallest number of poles (instead of the relevant column).
c) Applicable to two-pole circuit-breakers whether with two protected poles or with one protected pole.
d) This series is omitted when four-pole circuit-breakers are also tested.
e) Also applicable to circuit-breakers with three protected poles and a neutral pole.
f) Supplementary samples in case of single-pole circuit-breakers of 5.3.1.4.
g) This test sequence is omitted when three-pole or four-pole circuit-breakers have been tested.
h) This test sequence shall be omitted for two-pole circuit breakers with two protected poles, when three-pole or four-pole circuit-breakers have been tested.
i) When multipole circuit-breakers are submitted, a maximum of four screw-type terminals for external conductors are subjected to the tests of 9.5, i.e. two supply and two load terminals.

Table C.4 – Test sequences for a series of circuit-breakers being of different instantaneous tripping classifications

Circuit-breaker type-tested first	Subsequent test sequences for circuit-breakers of		
	B-type	C-type	D-type
B-type	–	$(D_o + D_1) + E$	$(D_o + D_1) + E$
C-type	D_o [a)] + B [a)]		$(D_o + D_1) + E$
D-type	D_o [a)] + B [a)]	D_o [a)] + B [a) b)]	–

a) For these test sequences only the tests of 9.8 and 9.10.2 are required.
b) When certification is requested at the same time for B-type, C-type and D-type circuit-breakers having the same rated short-circuit capacity, only test sequence Do is required if B-type and D-type samples have been tested.

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Clause	Requirement + Test	Result - Remark	Verdict

	Annex E		
	Special requirements for auxiliary circuits for safety extra-low voltage (*) (*) For auxiliary contact units assembled or to be assembled separately to circuit-breakers see EN62019.		
8.1.3	**Clearances and creepage distances**		
	Additional note to table 4 5) live parts in auxiliary circuits intended to be connected to safety extra low voltages shall be separated from circuits with higher voltages in accordance with the requirements of 411.1.3.3 of IEC 60364-4-41		--
	Compliance is checked by inspection		N/A
9.7.4	**Dielectric strength of the auxiliary circuits**		
	Note: a test for circuits intended for connection to safety extra-low voltage is under consideration		N/A
9.7.5	**Values of test voltage**		
	Note: The values of the test voltages for circuits intended for connection to safety extra-low voltage are under consideration		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Annex J		
	Particular requirements for circuit-breakers with screw less type terminals for external copper conductors (In not exceeding 20 A, cross-sectional area up to 4 mm^2		
J.6	**Marking**		
	Universal terminals		--
	- no marking		N/A
	Non-universal		--
	- declared for rigid-solid conductors	marked with: "sol"	N/A
	- declared for rigid(solid and stranded) ..... :	marked with: "r"	N/A
	- declared for flexible conductors ..... :	Marked with: "f"	N/A
	The markings should appear on the circuit-breaker or, if available space is not sufficient, on smallest package unit or in technical information ..... :		N/A
	Indication of length of insulation to be removed on the circuit-breaker ..... :	_____ mm	N/A
J.7	**Standard conditions for operation in service**		
	Clause 7 applies		N/A
J.8	**Constructional requirements**		
	Clause 8 applies with the follow modifications:		
	In clause 8.1.5 only –5.1, -5.2. –5.3, - 5.6 and -.5.7 apply		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.1	**Connection or disconnection of conductors**		
	The connection or disconnection shall be made by:		
	A general purpose tool or by a convenient device integral with the terminal or		N/A
	, for rigid conductors by simple insertion		N/A
	For disconnection an operation other than a pull shall be necessary (push-wire terminals)		N/A
	Universal terminals shall accept rigid (solid or stranded and flexible unprepared conductors		N/A
	Non-universal terminals shall accept conductors declared by the manufacturer		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.8.2	**Dimensions of connectable conductors**		
	The dimensions of connectable conductors are given in table J.1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The ability to connect these conductors shall be checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.3	**Connectable cross-sectional areas**		
	The nominal cross-sections to be clamped are given in table j.2		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.4	**Insertion and connection of conductors**		
	The insertion and disconnection of the conductors shall be made in accordance with the manufacturer's instructions		N/A
J.8.5	**Design and construction of terminals**		
	Terminals shall be designed and constructed that:		
	- each conductor is clamped individually		N/A
	- connection or disconnection connectors connected or disconnected separate or same		N/A
	- inadequate insertion of the conductor is avoided		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.6	**The terminals shall be resistant to ageing**		
	Compliance is checked by the tests of J.9.3		N/A
J.9	**Tests**		
	Clause 9 applies, by replacing 9.4 and 9.5 by the follow		N/A
J.9.1	**Test of reliability of screw less terminals**		
J.9.1.1	**Reliability of screw less system**		
	5 times connection and disconnection		N/A
	3 rigid conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A
	3 flexible conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A
	After tests, the terminal shall not be damage in such a way as to impair its further use		N/A
J.9.1.2	**Test of reliability of connection**		
	3 terminals of poles of new sample are fitted with new copper conductors according table J.2		N/A
	rigid conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A
	flexible conductors min. cross-section max. cross-section	_____ mm^2 _____ mm^2	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Each conductor is either pushed as far as possible into the terminal or shall be inserted so that adequate connection is obvious		N/A
	After tests, no wire of the conductor shall have escaped outside the terminals		N/A
J.9.2.	**Tests of reliability of terminals for external conductors: Mechanical strength**		
	Three terminals of new samples are fitted with new conductors of the type and of the minimum and maximum cross sectional area according table J.2.		N/A
	Each conductor is subjected to a pull force of value shown in table J.3. for 1 min		N/A
	Terminal screw torque : $^2/_3$ of table 10	_____ Nm	N/A
	rigid conductors min. cross-section max. cross-section	_____ mm^2 / _____N _____ mm^2 / _____N	N/A
	flexible conductors min. cross-section max. cross-section	_____ mm^2 / _____N _____ mm^2 / _____N	N/A
	During the test the conductor shall not slip out of the terminal		N/A
J.9.3.	**Cycling test**		
	The test is carried out with new copper conductors having a cross sectional area according table 9	_____ mm^2	N/A
	The test is carried out on new samples(a sample is one pole, the number of which is defined below, according the type of terminal		N/A
	- universal terminals for rigid (solid and stranded) and flexible conductors	3 + 3 samples	N/A
	- non-universal terminals for solid conductors only	3 samples	N/A
	-- non- universal terminals for rigid (solid and stranded) conductors	3 + 3 samples	N/A
	- non-universal terminals for flexible conductors only	3 samples	N/A
	The conductors is connected in series as in normal use to each of the three samples as defined on fig. J.1.		N/A
	The sample is provided with a hole or equivalent in order to measured the voltage drop on the terminal		N/A
	The test arrangement is placed in a heating cabinet which is initially on 20°C		N/A
	Except the cooling period the test current (rated current) is applied to the circuit	I test _____ A	N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	The samples shall be subjected to 192 temperature cycles, each cycle having a duration of $^{+}/_{-}$ 1 hour				N/A
	Description of the temperature cycle: In 20 min raised to 40°C, maintained for 10 min, then cool down in 20 min to 30 °C, maintained for 10 min. For measurement of the voltage drop it is allowed to cool down to 20 °C				N/A
	The maximum voltage drop, measured on each terminal, at the end of the 192nd cycle, with Inom. shall not exceed the smaller of the two following values - either 22,5 mV - or 1,5 times the value measured after the 24 cycle	Uv max. _____ mV			N/A
	Sample after 24 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 _____ _____	J_2 _____ _____	J_3 _____ _____	N/A
	Sample after 192 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 _____ _____	J_2 _____ _____	J_3 _____ _____	N/A
	After this test the samples shall shown no changes evidently impairing further use, such as cracks, deformations or like				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Annex K		
	Particular requirements for circuit-breakers with flat quick-connect terminations		
K.6.	**Marking**		
	The whole of clause 6 applies		
	Addition after the lettered item k		
	The following information regarding the female connector according to IEC 61210 and the type of conductor to be used shall be given in the manufacturers instructions		
	l) manufacturers name or trade mark		N/A
	m) type reference		N/A
	n) information on cross-sections of conductors and colour code of insulating female connectors (see table K.1)		N/A
	o) the use of only silver or tin-plated copper alloys		N/A
K.7	**Standard conditions for operation in service**		
	Clause 7 applies		N/A
K.8	**Constructional requirements**		
	Clause 8 applies with the follow modifications:		N/A
	replacement of 8.1.3 by:		N/A
K.8.1	**Clearances and creepage distances (see annex B)**		
	Subclause 8.1.3 applies, the female connectors being fitted to the male tabs of the circuit-breaker		N/A
	Replacement of 8.1.5 by:		N/A
K.8.2	**Terminals for external conductors**		
K.8.2.1	Male tabs and female connectors shall be of a metal having mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use		N/A
K.8.2.2	The nominal width of male tab is 6,3 mm and the thickness 0,8 mm, applicable to rated currents up to and including 16 A NOTE 1:The use for rated currents up to and including 20 A is accepted in BE, FR, IT, PT, ES and US		N/A
	The dimensions of the male tab shall comply with those specified in table K.3 and in figures K.2, K3, K4, K5, where the dimensions A, B, C, D, E, F, J, M, N and Q are mandatory		N/A
	The dimensions of the female connector which may be fitted-on are given in figure K.6 and in table K.4		N/A
	Compliance is checked by inspection and by measurement	See table on page _____	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
K.8.2.3	**Male tabs shall be securely retained**		
	Compliance is checked by the mechanical overload test of K.9.1		N/A
K.9	**Tests**		
	Clause 9 applies, with follow modifications:		N/A
	Replacement of 9.5		N/A
K.9.1	**Mechanical overload-force**		
	10 terminals of circuit-breakers, mounted as normal use are subjected to a axial push force and successively the axial pull force specified in table K2 applied to male tab once	push force 96 N pull force 88 N	N/A
	No damage which could impair further use shall occur to the tab or to the circuit-breaker in which the tab is integrated		N/A
	Addition to 9.8.3:		N/A
	Fine –wire thermocouples shall be placed in such a way as not to influence the contact or the connection area. An example of placement is shown in fig K.1		N/A

		Dimensions of tabs according Table K.3		Measured in mm	Verdict
		Minimum	Maximum		
A	Dimple	0,7	1,0	———	
	Hole	0,5	1,0	———	
B	Dimple	7,8 min		———	
	Hole	7,8 min		———	
C	Dimple	0,77	0,84	———	
	Hole	0,77	0,84	———	
D	Dimple	6,20	6,40	———	
	Hole	6,20	6,40	———	
E	Dimple	3,6	4,1	———	
	Hole	4,3	4,7	———	
F	Dimple	1,6	2,0	———	
	Hole	1,6	2,0	———	
J	Dimple	8°	12°	———	
	Hole	8°	12°	———	
M	Dimple	2,2	2,5	———	
	Hole	---	---	---	---
N	Dimple	1,8	2,0	———	
	Hole	---	---	---	---
P	Dimple	0,7	1,8	———	
	Hole	0,7	1,8	———	
Q	Dimple	8,9 min	---	———	
	Hole	8,9 min	---	———	
B3			7,8 max	———	
L2			3,5 max	———	

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Clause	Requirement + Test	Result - Remark	Verdict
	Annex L		
	Specific requirements for circuit-breakers with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors		
L.6	**Marking**		
	In addition to clause 6 the following apply:		
	Terminal marking according table L.1, on the circuit breaker, near the terminals		N/A
	Conductor types accepted:		
	Copper only	☐ None	N/A
	Aluminium only	☐ "Al"	N/A
	Aluminium and copper	☐ "Al/Cu"	N/A
	Other information concerning the number of conductors, screw torque (if different from table 10) and cross-section shall be indicated on the circuit-breaker	_____ Nm _____ mm²	N/A
L.7	**Standard conditions for operation in service**		
	Clause 7 applies		N/A
L.8	**Constructional requirements**		
	Clause 8 applies with the following exceptions:		
8.1.5.2	*is completed by:*		
	For connection of aluminium conductors, circuit-breakers shall be provided with screw-type terminals allowing the connection of conductors having nominal cross-sections as shown in table L.2		N/A
	Terminals for the connection of aluminium conductors and terminals of aluminium for the connection of copper or aluminium conductors shall have mechanical strength adequate to withstand the tests of 9.4, with the test conductors tightened with the torque indicated in table 10, or with the torque specified by the manufacturer, which shall never be lower than that specified in table 10.		N/A
	Compliance is checked by inspection, by measurement and by fitting in turn one conductor of the smallest and one of the largest cross-section areas as specified		N/A
8.1.5.4	Terminals shall allow the conductors to be connected without special preparation		N/A
	Compliance is checked by inspection and by the tests of L.9		N/A
L.9	**Tests**		

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Clause	Requirement + Test	Result - Remark		Verdict
	Clause 9 applies with the following modifications/additions:			N/A
	For the tests which are influenced by the material of the terminal and the type of conductor that can be connected, the test conditions of table L.3 are applied			N/A
	Additionally the test of L.9.2 is carried out on terminals separated from the circuit-breaker			N/A
L.9.2	**Current cycling test**			
	This test is carried out on separate terminals			N/A
	The general arrangement of the samples shall be as shown in figure L.1			N/A
	90 % of torque stated by the manufacturer or selected in table 10 used for the specimens	torque:_____Nm		N/A
	The test is carried out with conductors according to table L.5. The length of the test conductor from the point of entry to the screw-type terminal specimens to the equalizer shall be as in table L.6	cross-section:_____mm^2 minimum conductor length:_____mm		N/A
	Cross section of equalizer not greater than that given in table L.7	max. cross-section_____mm^2		N/A
L.9.2.4	Test method and acceptance criteria			
	Test loop subjected to 500 cycles of 1h current-on and 1h current-off, starting at an a.c. current value of 1,12 times the test current value determined in table L.8	test current:_____A		N/A
	Near the end of each current-on period of the first 24 cycles, the current shall subsequently be adjusted to raise the temperature of the reference conductor to 75°C			N/A
	At the end of the 25^{th} cycle the test current shall be adjusted the last time and the stable temperature shall be recorded as the first measurement. No further adjustment of test current for the remainder of the test			N/A
	Temperatures recorded for at least one cycle of each workin day, and after approximately 25, 50, 75, 100, 125, 175, 225, 350, 425 and 500 cycles			N/A
	For each screw-type terminal			N/A
	- the temperature rise shall not exceed 110 K			N/A
	- the stability factor Sf shall not exceed ± 10 °C			N/A
	ambient air temperature: _____°C	max. temperature rise [K]	max. stability factor Sf [°C]	N/A
	Terminal 1			N/A
	Terminal 2			N/A

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Clause	Requirement + Test	Result - Remark		Verdict
	Terminal 3			N/A
	Terminal 4			N/A
	Terminal 5			N/A
	Terminal 6			N/A
	Terminal 7			N/A
	Terminal 8			N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Annex 1	
	EN 60898-1 **COMMON MODIFICATIONS**	

	GENERAL		
9.12	**Short-circuit tests**		
9.12.2	Value of the power frequency recovery voltage shall be equal to 110 % of the rated voltage.		P
9.12.3	Tolerances on test quantities		
	voltage (including recovery voltage) : 0, -5%		P

	TESTS „A" 1 sample: D63, 4 poles		
6	**MARKING AND OTHER INFORMATION**		
6.1	**Standard marking:**		
	f) Rated short circuit capacity (A):within a rectangle, without symbol "A"..... :	6000 within a rectangle	P
	h)Calibration temperature, if different from 30°C		N/A
	j) Energy limiting class in a square in accordance with annex ZA, if applied		N/A
	k) Making and breaking capacity on an individual protected pole of multipole circuit-breakers (Icn1), if different from Icn		N/A
6.2	**Additional marking**		
	Additional marking to other standards (EN or IEC or other) is allowed under the follow conditions:		
	- the circuit-breaker shall comply with all the requirements of the additional standard;		
	- the relevant standard to which the additional marking refers shall be indicated adjacent to this marking and shall be clearly differentiated or separated from the standard marking according to cl. 6.1		
	Compliance is checked by inspection and by carrying out all the test sequences required by the relevant standard. Equivalent or less severe test sequences need not be repeated.		N/A
6.3	**Guidance table for marking**		
	Each MCB shall be marked in a durable manner with all or, for small apparatus, according table for marking		P

	TESTS „C" 3 + 1 SAMPLES: D63, 4 poles	**C_1**	**C_2**	**C_3**	

IEC/EN 60 898-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.11.3	Dielectric strength reduced to 900 V		P

	TESTS „E_3“				
9.12.11.4.4	**Test: E_3 (Test at making and breaking capacity on a individual pole (Icn1)**	E_{3-1}	E_{3-2}	E_{3-3}	
	Service short-circuit capacity ..... :	_____ A			--
	Test circuit: figure ..... :	3			--
	Prospective current ..... :	_____ A			--
	Prospective current obtained ..... :	_____ A			--
	Power factor ..... :	_____			--
	Power factor obtained ..... :	_____			--
	Sequence ..... :	O – t –CO 15° 45° 75°			--
	T (min) ..... :	_____ min			--
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	"a" = _____ mm			N/A
9.12.9.2	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm			N/A
	I_{Peak} (A) max. value ..... :	_____ A			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3	___ ---- ----	----- ___ -----	---- ---- ___	N/A
	- No permanent arcing				N/A
	- No flash-over between poles or between poles and frame				N/A
	- No blowing of the fuses F and F'				N/A
	- Polyethylene foil shows no holes				N/A
	After the test:				
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit –breaker is in the open position	E_{3-1} [mA]	E_{3-2} [mA]	E_{3-3} [mA]	
	The leakage current shall not exceed 2 mm L1				N/A
	L2				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	L3				N/A
	L4(N)				N/A
	Electric strength test:				
	Test voltage 900 V (see 9.7.3)				
	a)				N/A
	b)				N/A
	c)				N/A
	d)				N/A
	e) 2000 V				N/A
	Test current 2,8 I_N	_____ A			
	Tripping within > 0,1 s up to	[s]	[s]	[s]	
	- 60 s				N/A
	- 120 s				N/A

ANNEX C (NORMATIVE)

replace table C.1 by:

Test sequence and number of samples to be submitted for certification purposes
Table C.1 - Test sequences

Test sequence		Clause or subclause	Test (or inspection)
A		6 8.1.1 8.1.2 9.3 8.1.3 8.1.6 9.4 9.5 9.6 9.14 8.1.3 9.15 9.16	Marking General Mechanism Indelibility of marking Clearance and creepage distances (external parts only) Non-interchangeability Reliability of screws, current-carrying parts and connections Reliability of terminals for external conductors Protection against electric shock Resistance to heat Clearances and creepage distances (internal parts) Resistance to abnormal heat and to fire Resistance to rusting
B		9.7 9.8 9.9	Dielectric properties Temperature-rise 28-day test
C	C_1	9.11 9.12.11.2.1 9.12.12	Mechanical and electrical endurance Performance at reduced short-circuit currents Verification of the circuit-breaker after short-circuit tests
	C_2	9.12.11.2.2 9.12.12	Short-circuit test for verifying the suitability of circuit-breakers for use in IT systems Verification of the circuit-breaker after short-circuit tests
D	D_0	9.10	Tripping characteristic
	D_1	9.13 9.12.11.3 9.12.12	Resistance to mechanical shock and impact Short-circuit performance at 1 500 A Verification of circuit-breaker after short-circuit tests
E	E_1	9.12.11.4.2 and 9.12.12	Service short-circuit capacity (I_{cs}) Verification of circuit-breaker after short-circuit tests
	E_2	9.12.11.4.3 and 9.12.12	Performance at rated short-circuit capacity (I_{cn}) Verification of circuit-breaker after short-circuit tests
	E_3	9.12.11.4.4 and 9.12.12	Performance at rated making and breaking capacity (I_{cn1}) on an individual pole of multipole circuit-breakers Verification of circuit-breaker after short-circuit tests
NOTE With the agreement of the manufacturer the same samples may be used for more than one test sequence.			

replace table C.2 by:

Table C.2 - Number of samples for full test procedure

Test sequence		Number of samples	Minimum number of samples which shall pass the test [a) b)]	Maximum number of samples for repeated tests [c)]
A		1	1	--
B		3	2	3
C	C_1	3	2 [e)]	3
	C_2 [f)]	3	2 [e)]	3
D		3	2 [e)]	3
E_1		3 + 4 [d)]	2 [e)] + 2 [d), e)]	3 + 4 [d)]
E_2		3 + 4 [d)]	2 [e)] + 3 [d), e)]	3 + 4 [d)]
E_3		3	2 [e)]	3

a) In total, a maximum of two test sequences may be repeated.

b) It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

c) In the case of repeated tests, all results shall be acceptable.

d) Supplementary samples in the case of single-pole circuit-breakers rated 230/400 V or 240/415 V (see table 1).

e) All samples shall meet the test requirements of 9.12.10, 9.12.11.2, 9.12.11.3 and 9.12.11.4, as appropriate.

f) For this sequence read "number of protected poles" instead of "number of samples". In total a maximum of three test sequences may be repeated.

replace table C.3 by:

Table C.3 - Number of samples for simplified test procedure

Test sequence		Number of samples depending on number of poles [a]			
		One pole [b]	Two poles [c]	Three poles [d]	Four poles [e]
A		1 max. rated I_N	1 [g),i)] max. rated I_N	1 [i)] max. rated I_N	1 [i)] max. rated I_N
B		3 max. rated I_N	3 [g)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
C	C_1	3 max. rated I_N	3 [g)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
	C_2	3 max. rated I_N	2 max. rated I_N for 2 protected poles, or 3 max. rated I_N for one protected pole	1 max. rated I_N	1 max. rated I_N
$D_0 + D_1$		3 max. rated I_N	3 [h)] max. rated I_N	3 max. rated I_N	3 max. rated I_N
D_0		1 of all other rated I_N			
E_1		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N
E_2		3+4 [f)] max. rated I_N 3+4 [f)] min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N	3 max. rated I_N 3 min. rated I_N
E_3		[k)]	3 [j)] max. rated I_N	3 [j)] max. rated I_N	3 [j)] max. rated I_N

a) If a test is to be repeated according to the acceptance criteria of C.2, a new set of samples is used for the relevant test sequence. In repeated tests all results shall be satisfactory.
b) If only multipole circuit-breakers are submitted, this column applies to the set of samples having the smallest number of poles (instead of the relevant column).
c) Applicable to two-pole circuit-breakers whether with two protected poles or with one protected pole.
d) This series is omitted when four-pole circuit-breakers are also tested.
e) Also applicable to circuit-breakers with three protected poles and a neutral pole.
f) Supplementary samples in case of single-pole circuit-breakers of 5.3.1.4.
g) This test sequence is omitted when three-pole or four-pole circuit-breakers have been tested.
h) This test sequence shall be omitted for two-pole circuit breakers with two protected poles, when three-pole or four-pole circuit-breakers have been tested.
i) When multipole circuit-breakers are submitted, a maximum of four screw-type terminals for external conductors are subjected to the tests of 9.5, i.e. two supply and two load terminals.
j) If each pole of the multipole is identical to the individual pole tested in E2, this test is omitted. If not this test is carried out on an individual protected pole, taken at random, of the circuit-breaker with the highest number of poles
k) Covered by test sequence E2

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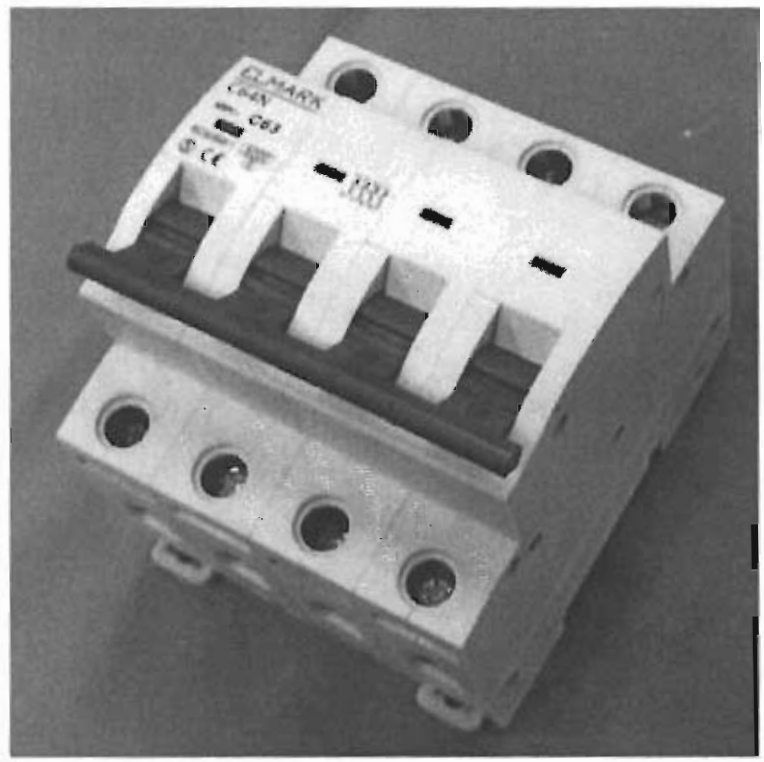
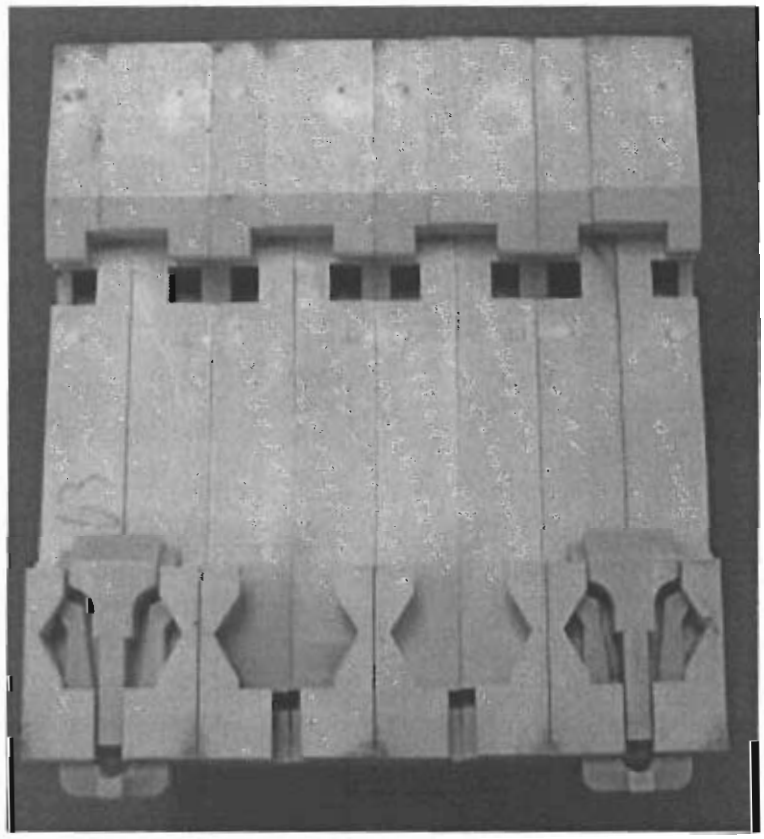
Clause	Requirement + Test	Result - Remark	Verdict

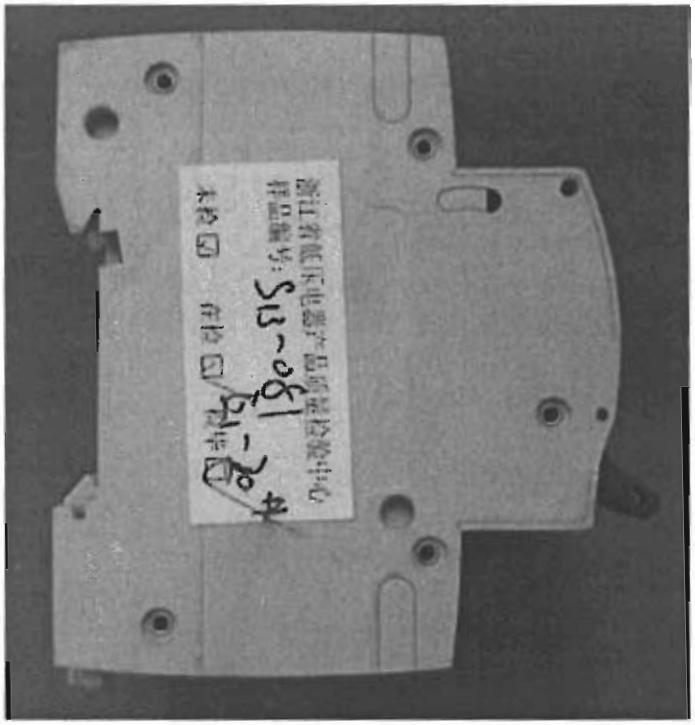
	Annex ZC (normative)	
	EN 60 898-1 **Special national conditions**	
	For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.	
J.1	**Austria, Czech Republic, Denmark, Germany, Netherlands, Norway and Switzerland**	
	The upper limit of current for use of screw less terminals is 16 A	N/A
J.3.3	**Austria, Belgium, Denmark, France, Germany, Italy, Portugal, Spain, Sweden, Switzerland, and United Kingdom**	
	Only universal screwless type terminals are accepted.	N/A
K1	**BELGIUM, FRANCE, ITALY, PORTUGAL, SPAIN, AND UNITED KINGDOM**	
	The use of circuit-breakers with flat quick-connect terminations for rated currents up to and including 20 A is accepted.	N/A
K.8.2.2	**BELGIUM, FRANCE, ITALY, PORTUGAL, SPAIN, AND UNITED KINGDOM**	
	The use for rated currents up to and including 20 A	N/A

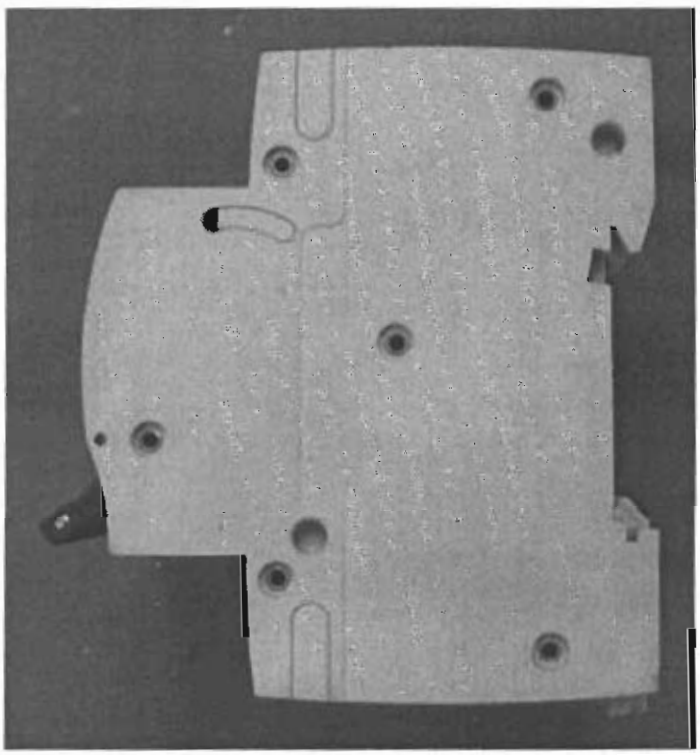
Photos of samples:





Photos of samples:





Photos of samples: